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Engineering and Mining Journal

McGraw-Hill Co., Inc. Price, 20c. New York, December 14, 1918

Crushing Costs

Ball Milling costs are made up of repairs, labor, and power. The repair costs are mainly for balls and liners.

1. In ball mill grinding the amount of abrasion depends on the ball load and the tonnage; being less with a light ball load and a large tonnage, therefore, the lowest possible cost is secured when this condition of operation prevails.

2. The Marcy Mill has a large crushing capacity with a comparatively small ball surface, and on account of its low pulp line, the balls are effective, thereby enabling it to crush coarse hard rock with ease. The small amount of pulp contained in the mill permits a rapid change of the contents, which results in high tonnage, because the crushed material is delivered quickly to the classifier for separation.

3. All repair parts have been carefully designed and are made of the best of materials. The liners, while of heavy construction may be readily passed through the man-holes. The liners can be made of cheaper materials and in many small pieces, but we do not recommend it, because of the poor service and trouble resulting therefrom.

We warn the mining public against misstatements on such points as segregation of balls, wear of liners, tests, etc. An investigation of Marcy mills or of any ordinary cylindrical mill will answer these questions correctly.

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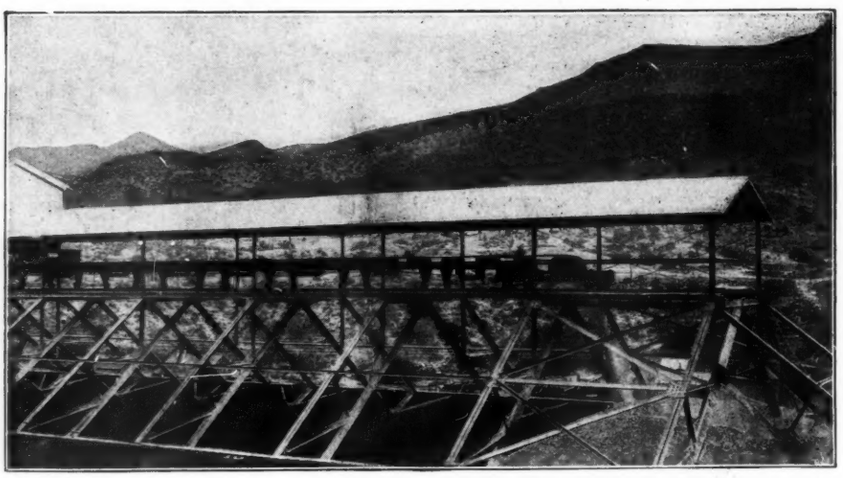
"S-A" SHUTTLE TYPE BELT CONVEYORS



A typical installation of the "S-A" Shuttle Type Belt Conveyor for a large copper mining company.

"S-A" Shuttle Type Belt Conveyors are frequently more economical for distributing ore to bins than ordinary trippers. In the installation shown, an inclined "S-A" Belt Conveyor 42 inches wide by 266 feet centers, delivers the ore to a point above the bins onto the Shuttle Conveyor. This Conveyor is 42 inches wide by 116 feet centers. It is mounted upon a portable frame supported on rails. It is reversible and may thus be arranged to deliver to any one of the bins within a range of over 200 feet. The capacity of this system is 10,000 tons per day.

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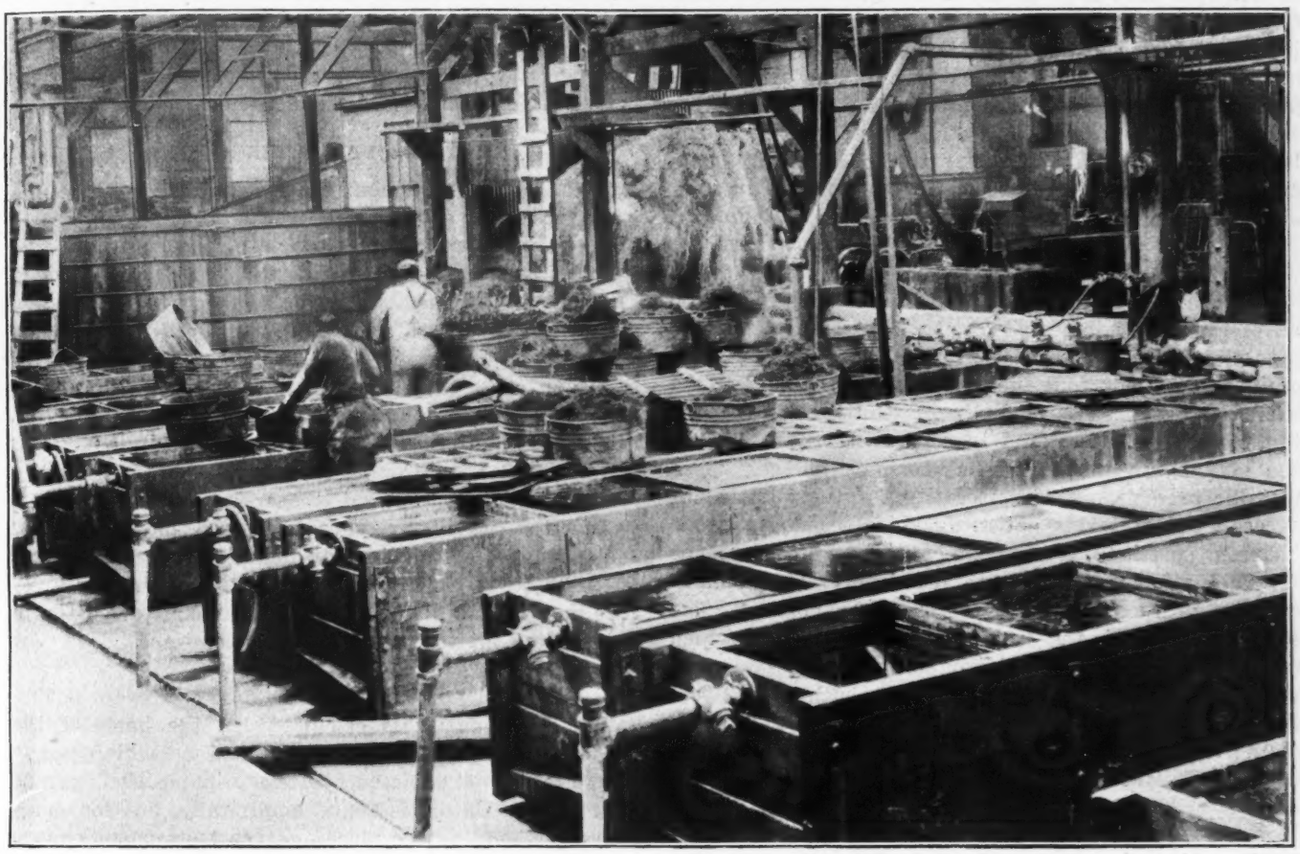


FIG. 1. CLEANING UP IN A CYANIDE PLANT

Zinc-Box Practice

By A. W. ALLEN

The continued and universal use of zinc shaving for the precipitation of gold and silver from cyanide solutions is indicative of the practicability and advantage of that method. A sound reason for its retention is that good results may be achieved without fine adjustment. High-grade bullion may be obtained by simple methods of control, one of the principal advantages of the system being that excess zinc, used in quantity to insure complete or nearly complete precipitation, may be screened off from the valuable precipitate, thus avoiding undue contamination with base metal used as a precipitant, and insuring a high-grade product without excessive refining costs. So long as the zinc-shaving method is not replaced by something even simpler and less "fool-proof," there is little likelihood of its being relegated to a position of minor importance.

THE continued utilization of zinc shaving as a precipitant of the precious metals in a pregnant cyanide solution may be adduced as a justification for epitomizing the various improvements in method which have been evolved during many years of practice. Until an even more simple method is introduced there will be ample scope for the installation of zinc-shaving plants, especially among the smaller installations. The zinc-shaving method of gold and silver precipitation was the first successful process, from both the commercial and metallurgical aspects; and was an integral part of the original MacArthur-Forrest method.

The introduction of a number of improvements in connection with the use of zinc, aluminum, and charcoal

dust has resulted in the focusing of a considerable amount of attention on the use of a precipitant that may be automatically added, in proper proportion, to the solution; but it must be realized that an exact adjustment of feed, to precipitate a varying metal content, is impracticable under ordinary conditions. The alternative is to add an excess of precipitant, and so insure against fluctuations that may occur in the grade of the solution. If the ore is of variable grade, it is often found impracticable to avoid either the trouble of admixture of precious metal with excess precipitant, or the imperfect precipitation of the metal on account of occasional shortage in the supply of the precipitant. The last-mentioned result must usually be avoided at all costs, because it generally leads to an otherwise avoidable loss of dissolved gold or silver in the residue.

Powdered Charcoal as a Precipitant

The use of an excess of precipitant is followed by no adverse results when gold or a gold compound may be precipitated by powdered charcoal. The excess of precipitant does not foul the solution, and, although the extra ash produced naturally increases the cost of smelting, no difficulty is found in separating the ash from the gold by means of heat and simple fluxes. With metallic precipitants, the necessity for the addition of excess base metal is often unavoidable if low-grade "barren" solution is needed; and provision must be made for fluctuation in precious-metal content. The primary cause of such excess may be fouling of the solution. The secondary effect is the fouling of the precipitate, which may be remedied by the introduction of the necessary refining plant. In large installations such a modification is often justified. In medium-sized and small plants there is a disposition to look for a simpler and equally effective solution of the problem.

Combination Dust and Shaving Precipitation

When the advantage to be gained by the use of a pulverized precipitant for the removal of the bulk of the gold and silver is recognized, it has been found practicable to precede ordinary zinc-shaving precipitation with the use of a zinc-dust process, whereby a much higher-grade product is obtained as a result of the subnormal use of the precipitant and the avoidance of an unnecessary contamination of gold and silver with excess zinc. The partly precipitated solution is then barrenized by being passed through zinc shavings, from which the metals are recovered in the usual way.

The conservative retention of zinc shavings is almost entirely due to the fact that the design and construction of the equipment present no difficulties, and operation and adjustment are exceedingly simple. The economy of the method, in many instances, may be questioned, but it possesses the great advantage of being universally applicable as a precipitant in the cyanidation of ores of almost every class, and of solutions of even the lowest grade. An immense surface of precipitant can be provided, and excess zinc can be to a large extent removed from the resulting precious-metal sludge by simple screening or other separating methods.

In cyaniding silver ores it is practicable to operate so that all excess zinc is returned to the boxes after the precipitate has been separated out by means of screening. A comparatively coarse shaving is suitable, as the problem of the elimination of excess zinc associated with the silver presents no difficulties, and 1-400 in. in thickness may be used. Even coarser cutting is often found desirable. With gold ores, on the other hand, there is usually a variable amount of "short" zinc which it is not advisable to return to the boxes. This is, therefore, either roasted or acid treated. Under such conditions it is advisable to use a fine shaving, and 1-750 in. is a thickness often adopted. Owing to the varied conditions prevailing in cyanide work, it is preferable to experiment with a number of thicknesses of shaving before deciding as to the type most desirable.

Hints About Dressing Boxes

One of the commonest causes for zinc-box trouble is due to cloudy solutions. For this there is no excuse. Slime can be separated by simple means, and very fine flocculent material, remaining after opportunity to settle has been provided, should be removed by means of a clarifying press. The press should be required to handle only exceedingly fine matter. The amount of this is usually small, so that crystal-clear solution is always passing through the boxes, and the filter press needs cleaning out only occasionally. Ample storage for unclarified solution is advisable; and it is usually practicable to erect the vat to carry this at an elevation, so that the gravity pressure will be sufficient to insure continuous filtration in the press. A head of from 15 to 30 ft. is usually ample, although a greater pressure may be useful if an abnormal amount of obstinate non-settling matter is found in the solution.

Calculating Zinc-Box Capacity

Zinc-box capacity is calculated on the basis of the number of tons of solution that can be satisfactorily precipitated per cubic foot of zinc, in position, per 24 hours. This datum is found empirically, but too much reliance should not be placed on the tests usually made to determine it. Zinc boxes are cheaply constructed, and an additional two or three compartments, over and above the number actually required, will be found an invaluable aid in simplifying operations and in shortening the time of clean-up.

Number of Zinc-Box Compartments May Be Varied

Assuming ample capacity, a great saving of labor will be effected by adopting a system which takes into consideration the fact that the precipitating efficiency of a compartment of zinc shavings gradually decreases from the time circulation begins. If no excess capacity is provided, the adjusted amount of zinc will suffice to satisfy precipitation requirements for so short a time that perpetual dressing is unavoidable. This is undesirable, and may be prevented by the exercise of a little forethought.

A seven-compartment box, such as is illustrated in Fig. 1, is one of a number of types in common use. Experimentation may indicate that complete and satisfactory precipitation is possible with four freshly packed compartments. Further empirical data should be obtained to demonstrate the period which will ordinarily elapse before the barren solution gains in metal content, on account of the disintegration and short-circuiting of the solution and the occlusion of the zinc surface

with deposited gold and silver. A little investigation may show that 48 hours will elapse before there is appreciable rise in the grade of effluent solution. The fifth compartment in the box may then be packed; and, if this action staves off a rise in metal content in the effluent for 24 hours, the sixth compartment can be packed during the next day. The work of filling a clean compartment with fresh zinc is a matter of only a few minutes; and, by adopting a suitable modification of the plan outlined, a considerable saving of labor may often be effected, and the liability of mechanical loss of precious metal may be correspondingly reduced.

Concentration of Precipitate Necessary

An objection to the aforementioned plan—that it will involve an undesirable distribution of precious metal over the surface of a large amount of zinc—does not hold good for about half the usual time between clean-ups, that is, during that period which immediately follows one of them. With the approach of a clean-up, it becomes necessary to dress the boxes more often, and so make conditions most favorable for the disposition of the maximum amount of precious metal with the minimum amount of zinc. Therefore, fresh zinc should never be placed in the first compartment. If a layer of coarser material is needed to ensure even percolation of the solution, or to form a bed for the short zinc which has accumulated, long filaments from one of the lower compartments, which are already plated, should be used.

First Compartment Need Not Be Always Filled

The first compartment in a zinc box need not always be filled with precipitant. It is highly advisable that the dissolving effect of the incoming solution, always greatest at its first contact with the shavings, should be expended on short zinc, and this attacking action should be concentrated on the first compartment as much as possible before the clean-up, and the precious-metal sludge removed in a concentrated form. It is, therefore, better to reduce the depth of fine material in the first compartment, rather than to add too much coarse shavings. A considerable saving in time and expense has often been made by regulating the box-dressing operations along the suggested lines.

Undesirable Features in Zinc-Box Design

A few types of zinc boxes may be mentioned in order to discourage their further use and possible adoption. One of these has a flat, level bottom, and cannot be cleaned up without an inordinate amount of labor. The second type has either flat or sloping bottom, but no means of drainage. A third undesirable type is of such dimensions that, when dressing or cleaning up, two operators, one on each side of the compartment, cannot conveniently reach all parts. A fourth type to be avoided has the bottom of each compartment sloping to a central discharge point, which is, therefore, in an inaccessible position underneath the box. The discharges from each compartment are directly connected with a main pipe by means of T-pieces; and flow is controlled by means of wooden plugs driven from the inside of the box, which are accessible only when the solution is lowered. Apart from the difficulty, if not impossibility, of regulation at clean-up times, the trouble which must inevitably occur with heavy gold or silver precipitate in an inaccessible pipe can well be imagined.

A type of zinc box that is eminently satisfactory, economical to operate, and neat in appearance is shown in Fig. 2. It will be noticed that it is supported on an iron framework base, thus permitting absolute cleanliness underneath. A smooth concrete floor, draining to the clean-up or other sump, is, of course, a feature of construction.

Clean-Up Practice

Previous to the clean-up it is advisable to operate the boxes with a minimum of zinc consistent with satisfactory precipitation. Periods between dressings will become less as the date approaches. The final dressing before the clean-up should include the moving up of all the zinc in the lower compartments of the box, and the cleaning out of the last three or possibly four compartments, by transferring any cloudy solution, or sludge found below the screen, to the point of solution intake, so that the gold and silver precipitate in it can be recovered at the clean-up.

Just before the clean-up it is often practicable to fill two or even three of the lower compartments with fresh zinc. These will accumulate no appreciable quantity of metal during the space of 12 hours or so. When the busy day comes, not only will it be unnecessary to touch these compartments, but it will be possible to begin the flow of solution as soon as the upper compartments have been cleaned out, and the excess zinc has been returned.

Labor and Time Saving at the Clean-Up

In most plants no extra skilled help is available at clean-up time, and attention must often be divided between the clean-up and regular routine duties. Under these conditions any plan that insures labor saving, without in any way impairing the results, should be encouraged by the superintendent. If the work connected with the monthly or semi-monthly clean-up can be distributed more evenly over the day preceding and that following, as well as over the busy day itself, operations will be found to proceed much more smoothly. The adoption of the suggestions outlined in the preceding paragraph resulted in a saving of 12 hours in cleaning-up operations in one plant, with the very reverse to impairment of efficiency. The zinc boxes were all in operation before noon on the opening day of the clean-up, whereas previous practice had invariably resulted in delays that postponed transference of unpressed precipitate, the teasing of zinc, and the packing of the boxes far into the night. When important work is afoot, attention should be paid, in preliminary planning, to that arrangement of routine which eliminates the unnecessary, so that the chaos that too often accompanies a clean-up may be avoided.

Distribution of Zinc at Clean-Up Time

The half-tone at the beginning of this article is an excellent illustration of what should be avoided. The boxes were erected so that the operator must stand in a back-breaking attitude to do his work; and a use for the valve placed on each of the exit pipes can be known only to the designer. The number of tubs of plated zinc standing around and piled on top of the boxes is

reminiscent of the confusion that often exists when an inexperienced hand is setting out on a journey, and, as a preliminary, has surrounded himself with his numerous effects before beginning to pack his trunks.

Little or no long zinc need be removed from the box in most instances. The adoption of a logical system will obviate a great amount of labor, and save time and temper. It may be assumed that the contents of the first two compartments are fairly well down when the work begins. Immediately after the solution (or cleansing water) has been shut off, the amount of liquor in these two compartments should be reduced to a minimum, so that only sufficient remains to make the wash-

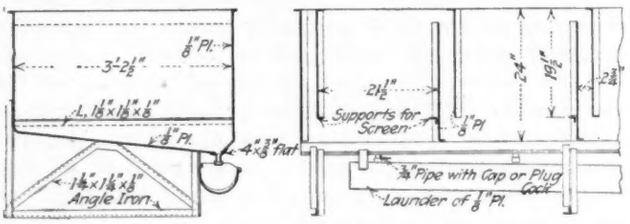


FIG. 2. CROSS AND LONGITUDINAL SECTION OF WELL-DESIGNED ZINC BOX

ing of any long zinc effective. The liquid may be lowered by bucketing the surplus over the edge of the first compartment, so that it passes into the bottom of the second, and so on. Any coarse zinc remaining in the first compartment is then washed, before the screen is raised, and transferred to the second compartment. As soon as practicable the valve or plug on the outlet pipe is opened, and the contents of the compartment are flushed to the clean-up sump, over which the necessary sieve is placed.

The screen to support the zinc is washed with a spray, and replaced; and repacking is begun. A layer of plated zinc, taken from a lower compartment, forms a suitable bed, after which the coarse zinc is replaced, and the compartment finally filled with washed zinc from the second compartment, which is then cleaned out and filled in the same way. In lowering the solution level in subsequent compartments, any slightly cloudy liquid encountered can be returned to the first compartment.

The cleaning-up of any number of units is merely a question of duplicating the method described. It is entirely unnecessary to permit trays and tubs of oxidized steaming zinc to remain exposed in the manner frequently to be observed. Except as to the treatment of the material in the first compartment, already detailed, all zinc, as soon as washed, should be immediately packed in another compartment.

New Zinc Addition Often Unnecessary at Clean-Up Time

If the practice of cleaning out and filling up the final compartments just before the clean-up is adopted, it will, unless a considerable amount of zinc is removed, obviate the necessity for the handling of new zinc, or, in any event, only a small quantity will be necessary on the day the boxes are cleaned out. One or two empty compartments may be left in the center of the box, but this is of no consequence, and the regular arrangement can be resumed as soon as the clean-up is over and there is opportunity to attend to unimportant and temporarily deferred details.

Rate of Solution Flow Through Zinc Box

An important factor in successful operation is correct rate of flow of solution through the zinc box. The supply pipe is not invariably under a constant head, so that it is impossible to adjust the amount of solution entering the box according to the position of the handwheel on the valve. Usually the level of the liquor in the last compartment is taken as a rough indication, or the exit pipe is plugged so that only a certain amount will pass through. All these methods are unsatisfactory. A rapid method of computing, with tolerable accuracy, the rate of flow in fluid tons per 24 hours is imperative, so that this may be adjusted to conform to the condition and quantity of zinc in the box. Greater attention to this detail results in a saving of cyanide and zinc, and insures uniformity in grade of tail solution.

Rate of Flow Based on Weir Measurement Formulæ

Realizing that the ordinary compartment, with its leveled overflow, presented unusual opportunities for an estimation, by means of the ordinary weir formulæ, of solution passing, I once decided to control the flow by regulation, after measuring the height of the liquid at the back of the last compartment, as compared with the level of the partition at the point of overflow. Owing to the comparatively narrow limits of rise and fall,

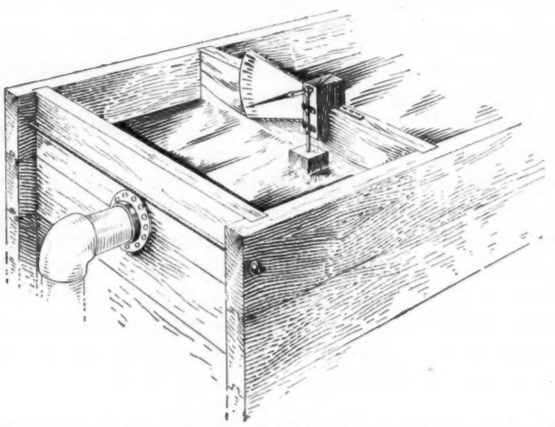


FIG. 3. RECORDER SO GRADUATED AS TO INDICATE SOLUTION FLOW

direct estimations proved to be impracticable, but results would have been better had the overflow width for this particular compartment been constricted to a few inches. The measurements were made by means of a burette with stopper removed, placed in the compartment. Inside this there was a float indicator, on the top of which a wire finger indicated the rise or fall by means of a scale on the outside of the burette.

None of the well-known tables in various engineering pocket books, or treatises on hydraulics, were of any value for weir measurements of a fraction or so of an inch in water depth, and attempts to compute a new formula which would give consistent and truthful results for very low heads were unsuccessful. It was therefore decided to graduate the recording apparatus by means of figures obtained empirically. For this pur-

pose a cubic foot measure was taken and the tonnage calculated by time according to the table presented herewith. A recorder was built, as shown in Fig. 3, which could doubtless have been improved upon had better facilities existed.

TABLE FOR CALCULATING APPROXIMATE FLUID TONS PER 24 HOURS BY TIME TAKEN TO FILL A 1-CU.FT. MEASURE

Seconds	Tons per 24 Hours	Seconds	Tons per 24 Hours	Seconds	Tons per 24 Hours
1	2700	21	128	41	66
2	1350	22	123	42	64
3	900	23	117	43	63
4	675	24	112	44	61
5	540	25	108	45	60
6	450	26	104	46	59
7	386	27	100	47	57
8	337	28	96	48	56
9	300	29	93	49	55
10	270	30	90	50	54
11	245	31	87	51	53
12	225	32	84	52	52
13	207	33	82	53	51
14	193	34	80	54	50
15	180	35	77	55	49
16	169	36	75	56	48
17	159	37	73	57	47
18	150	38	71	58	47
19	142	39	69	59	46
20	135	40	67	60	45

Efficient control of solution-flow through zinc boxes is a matter of considerable importance. The quantity and condition of the zinc varies from day to day, and automaticity is consequently impracticable. A method of direct reading should therefore be welcomed.

Ontario Mines Production in 1918

The returns received by the Ontario Bureau of Mines from the smelteries, refining works, and metalliferous mines of the province for the nine months ended Sept. 30, 1918, are summarized in the accompanying table, which, for purposes of comparison, gives figures for the corresponding period in 1917:

SUMMARY OF ONTARIO MINES PRODUCTION, FIRST NINE MONTHS, 1918

Product	1917	1918
Gold, oz.	326,779(a)	332,644(a)
Silver, oz.	15,236,002	13,145,596
Cobalt, metallic, lb.	295,866	317,291
Copper, metallic, lb.	.....	359,713
Nickel, metallic, lb.	166,921	582,992
Nickel oxide, lb.	10,831	5,592
Cobalt, oxide, lb.	276,769	397,728
Other cobalt and nickel compounds, lb.	276,217	367,923
Molybdenite, lb.	65,827	43,631
Lead, pig, lb.	1,080,000	1,291,571
Nickel in matte, tons	31,064	33,508
Copper in matte, tons	15,928	17,052
Copper ore, tons	2,658	16
Iron ore, tons	138,808	164,243
Pig iron, tons	513,232	541,564

In 1917 nickel and copper in the form of matte were valued at 25 and 20c. per lb. respectively. For 1918 the values have been placed at 30c. for nickel and 20c. for copper.
(a) Estimated by dividing value by $20.67.

Gold production has been well maintained for the period, considering adverse war conditions, which have been aggravated rather than improved during 1918. The signing of the armistice on Nov. 11 will have the effect of releasing men almost immediately from munition plants, and this will tend to relieve the labor shortage which the mining industry as a whole has experienced. The value of the output, $6,875,766, exceeds that for the corresponding period in 1917. This was produced from 711,185 tons of ore milled. In addition, 65,939 oz. of silver, worth $64,029, was recovered. The Hollinger and the McIntyre mines continue to be the largest producers, the output respectively being valued at $4,685,586 and $1,206,875. New producers this year include the Davidson, at Porcupine; the Patricia, at Boston Creek, and the Lake Shore, at Kirkland Lake. From the last mentioned, since milling operations started in March, 11,253 tons of ore was treated, with a recovery in gold and silver of $271,265, or $24.10 per ton. At the Boston Creek a new find of gold telluride on the Miller Independence has attracted a great deal of attention to this camp.

Despite a decline in ounces produced, the output of silver for the first nine months of 1918, if maintained for the rest of the year, will probably equal in value that of any other year in the history of the Cobalt camp. The average New York price of metal for the period was 95.21 c. per oz., the present price of silver being $1.01½. Mines shipping 750,000 oz. or over are Nipissing, Mining Corporation of Canada, Kerr Lake, and O'Brien. Shippers this year to date include mines that have been idle for some time. Among them are the Edwards & Wright, Ltd., operating the Green Meehan, at North Cobalt; the Silver Eagle and Keeley mines, in South Lorrain, and Peterson Lake. Many of the mines are now treating slimes and tailing dumps by flotation methods.

The southern Ontario refineries treated 2758 tons of ore, 1208 tons of concentrates, and 1847 tons of residues, with a recovery of 3,655,975 oz. of silver, in addition to cobalt and nickel in the form of metal, oxides, and other compounds of these metals. About one-third of the output of cobalt metal by the Deloro Smelting and Refining Co. was used in the production of "stellite." Nickel metal from silver-cobalt-nickel ores was marketed to the extent of 224,787 lb., worth $89,275.

The only copper-ore shipment was a trial lot by the Hudson Copper Co., of Havilah. High operating costs, increased freight rates and smelting charges, and lack of a customs smeltery within the province contribute to make copper mining unprofitable at present. As a result of the operations at the new Port Colborne refinery of the International Nickel Company of Canada, there was a production of metallic nickel and copper from nickel-copper matte. The refinery started last July, and up to the end of September had produced 358,205 lb. of nickel and 359,713 lb. of copper. The Copper Cliff and Coniston smelteries treated 1,141,089 tons of ore, producing therefrom 64,926 tons of matte, containing 33,688 tons of nickel and 17,232 tons of copper.

The production of pig lead was in excess of the 1917 output, but a lower price prevailed. The only mine and smeltery operating is that of the James Robertson Estate, at Galetta, on the Ottawa River. The entire product is shipped to the headquarters of the company at Montreal. The output of molybdenite concentrates shows a decrease. Molybdenum is one of the war metals, and as a result of the armistice the demand has declined. Early in the year the International Molybdenum Co., of Orillia, and the Tivani Electric Steel Co., of Belleville, produced ferromolybdenum to the extent of 19,410 lb., worth $59,153. Electric Foundries, Ltd., of Orillia, produced in experimental work 1800 lb. of ferromanganese. This last-mentioned company and the Tivani company are now engaged in the electric-furnace production of low phosphorus pig iron.

Remember the Comfort Fund of the 27th Engineers.

Feeding Flotation Oil in the Coeur d'Alenes

BY C. T. RICE

Some flotation oils flow freely and can be dripped by simple means into the pulp stream in even and regular quantity. In this paper various methods and contrivances adopted to insure a regular supply, of the proper quantity, of the various classes of oil, are described and comment made thereon.

AS THE oils used in the Cœur d'Alenes are practically all easy-running, clean oils, such as No. 5 G. N. S. pine oil, No. 2 Cleveland-Cliffs hardwood creosote, No. 8 G. N. S., No. 350 Pensacola and pine tar oils, they are generally dropped in the pulp from a can through an ordinary cock. At a few of the mills, feeders are used. One of the best of these is the pump used at the Gold Hunter plant. Others are on the displacement idea first adopted in the district by Mike P. Dalton, at the Frisco plant, when difficulty was experienced in feeding the oil regularly and in a small enough amount. In such displacement feeders, water is dropped through a pipe that carries it underneath the oil in the can that feeds it to the pulp. Thus, by regulating the drip of the water, the feed of the oil is also regulated. When a collector oil, as a heavy creosote, is to be fed, it is often mixed with enough No. 5 pine or other light oil to make it lighter than water,

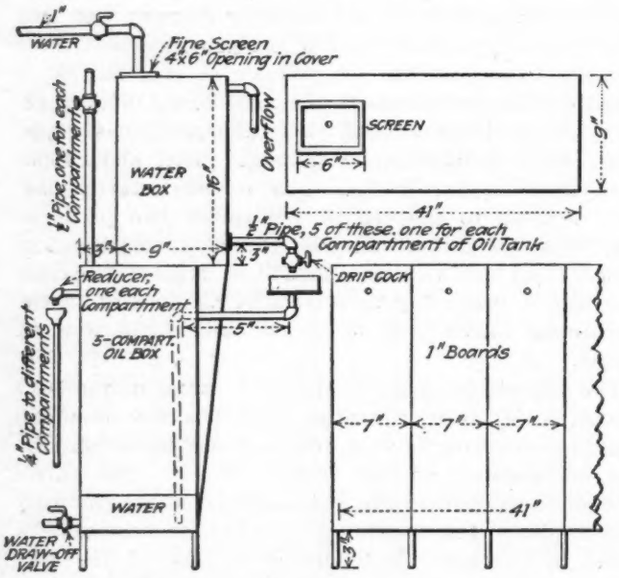


FIG. 1. DALTON OIL FEEDER

and then fed to the pulp by displacement. The favorite proportion is 80% pine oil to 20% heavy creosote. Often it is not desirable to have any more of the lighter oil in the pulp than is already in it when the collector is added. When that is the case, the displacement feeder can still be used by making up a salt solution of sufficient strength to float the heavy oil. Then the oil can be displaced by dropping this solution into the oil well. This method of feeding heavy oil was used at the Bunker Hill & Sullivan plant when different oils were being tried on Bunker Hill ore.

The Dalton type of feeder used at the Hercules plant to feed oil to the different compartments of the five-cell Janney machines treating granular slime is shown in Fig. 1. Sight glasses are used on the oil wells of one of the feeders to show the amount of oil that is in each of them at any time, but it has not been found to be of sufficient advantage to warrant its installation on the latest type.

A pipe carries water to an upper box, which constantly overflows so as to keep the pressure the same at all times upon the different cocks from which the water is dripped

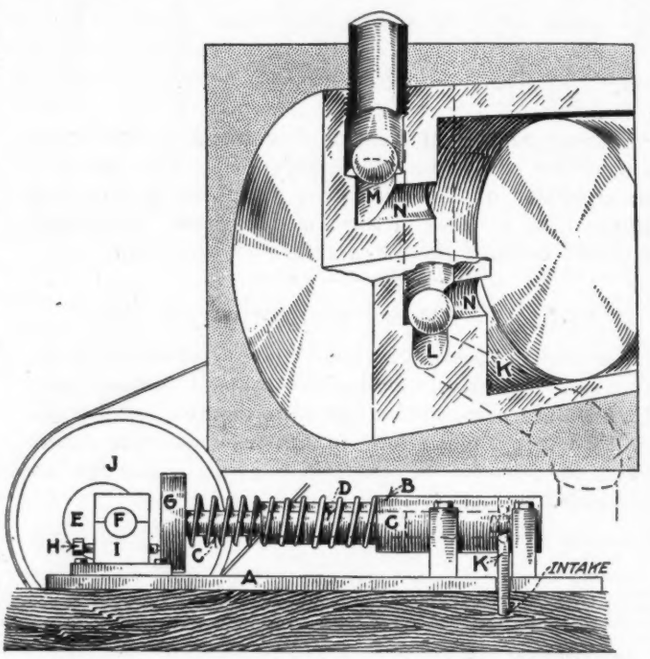


FIG. 2. OIL FEEDER USED AT GOLD HUNTER PLANT

into the oil boxes below. The pipe that catches each water drip enters the oil well at the side and near the top, and then goes down through the oil almost to the bottom of the well, so as to displace the oil without mixing with it. Each oil well has a drain pipe through which the water is drawn off when more oil must be added to the well. At the Hercules plant, the oil used in the different flotation machines is piped to the feeders from a large steel tank at the top of the mill, into which oil is loaded from the upper railroad track, a tank car at a time. This is an especially convenient and economical way of handling the oil when much is used.

Details of the construction of the oil feeder used at the Gold Hunter plant are shown in Fig. 2. The feeder consists of a steel base plate *A*, 10-in. long by 4 in. wide by ½-in. thick, bolted to a timber. On this is attached the brass pump cylinder *B*, and the bearings *I*, that carry the drive shaft *F*. On this shaft is bolted the pulley *J* and the cam *E*, which is nothing but a cylindrical disk mounted eccentrically on the driving shaft. This disk operates against another disk, *G*, shrunk on the end of the pump plunger *C*. The forward travel of this plunger is effected by the push of the eccentric disk against the disk end of the plunger. Its reverse motion

is effected by a spiral spring which surrounds the plunger guide box *D* and seats against the end of the cylinder. Stroke adjustment is made by the screw *H*, which is mounted in a small pedestal carried by the base plate and which regulates the travel of the plunger and the amount of the oil fed. The guide barrel *D* is made of brass and screws into the end of the cylinder *B*. This cylinder is made by boring out a barrel for the plunger in one end of a brass block and then connecting this cylinder pocket by $\frac{5}{16}$-in. ducts, *N*, with $\frac{3}{8}$-in. holes, *L* and *M*, bored down from the top to receive $\frac{3}{8}$-in. balls that act as valves to the pumps.

The oil enters the pump through duct *K*, $\frac{5}{16}$ in. in diameter, drilled from the side to connect with valve pocket *L* and tapped to receive a $\frac{1}{4}$-in. pipe. The oil discharges through the top of valve pocket *M*, which is also tapped to receive a $\frac{1}{4}$-in. pipe. Valve pocket *L* is similarly tapped, and is closed with a plug as soon as the steel ball that serves as the valve has been put into the valve pocket.

The feature of the pump is that it has no stuffing box and uses steel balls for valves. It is simple in construction and design, and its parts are easily accessible. The plunger, cylinder, and guide barrel may at first seem long, but they must be made so in order to give the pump long life. In the absence of a stuffing box, dependence is placed entirely upon the long, tight fit between the plunger, cylinder, and barrel guide. At first this barrel guide was made much shorter than shown, but, owing to the side thrust developed by the friction between the driving disk and the end disk of the plunger, side wear was such that in about four months the barrel guide had to be renewed. A long guide barrel was then adopted,

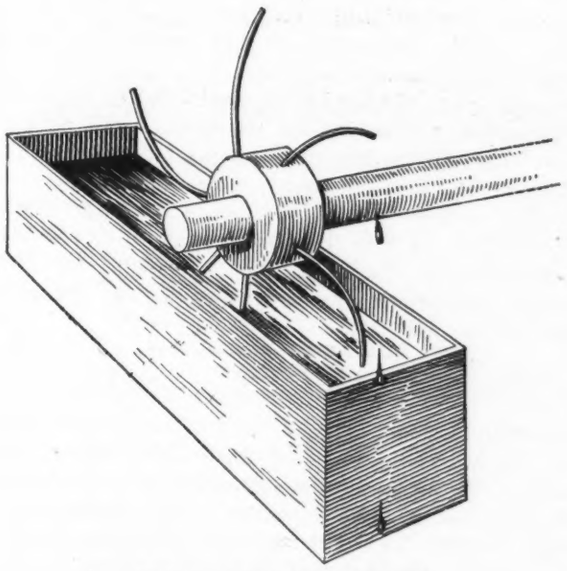


FIG. 3. DRIP OIL FEEDER

and the pump has now run a year and a half without requiring any renewal and with little appreciable wear.

The driving shaft is belted so as to run at about 14 r.p.m., and the control screw is adjusted so that there is a travel to the plunger from $\frac{1}{8}$ to $\frac{1}{4}$ in., according to the amount of oil needed by the pulp. Advantages in this pump are simplicity and positiveness of the feed, as well as its ease and delicacy of adjustment.

A simple and satisfactory oil feeder is the drip wheel (Fig. 3) used by H. M. Throndson at the Sweeney plant. This consists of a belt-driven wooden hub into which bent baling-wire spokes are inserted. These spokes dip into an oil pan and drop the oil as they reach the launder that feeds the pulp to the emulsifying Pachuca. This feeder is simple and effective, and the number of drops is easily changed by adding or taking out spokes or by

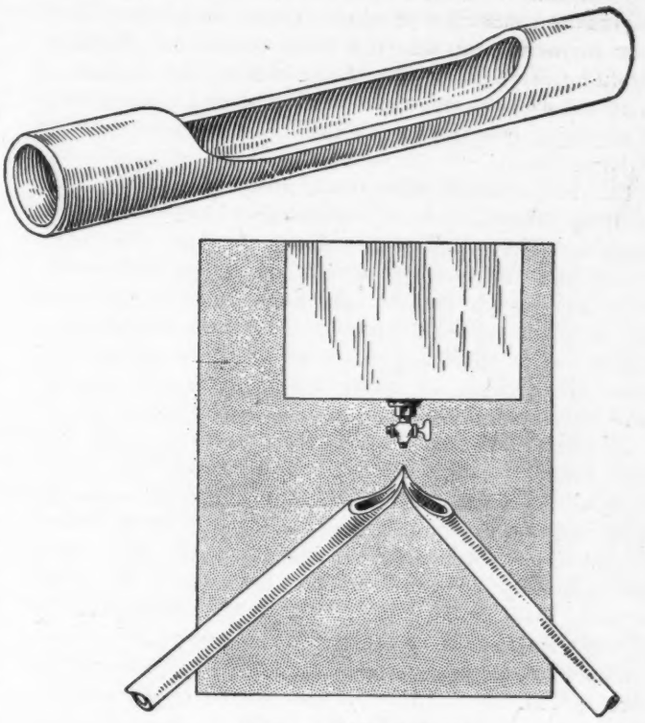


FIG. 4. OIL DROP SPLITTER

altering the speed at which the hub rotates. The feed pan can be supplied by drip from another pan, through a cock, or in several other ways, but probably best by drip from a feed can. This wheel can be used to feed any kind of oil, light or heavy.

An effective way of splitting the oil feed that may prove of utility has been devised by Mr. Throndson. This drop splitter (Fig. 4) is made by taking a $\frac{1}{2}$-in. pipe and cutting away half of it for a distance of about 4 in. along the middle. The pipe is then bent back so that the two legs form an angle of about 90° with each other. The edge formed by the bend is then filed to a knife edge, and the splitter is so mounted that the drop will fall on this edge and be cut in two.

Chino Copper Co.

The 28th quarterly report of the Chino Copper Co., covering the months of July, August, and September, 1918, shows that 932,000 tons of ore was treated, being an average daily tonnage of 224 more than for the second quarter. The average copper content of the ore was 1.6233%, as compared with 1.5773% for the previous quarter. The gross production of copper contained in concentrate from milling operations is given as 10,449,195 lb., but it is probable that 19,449,195 lb. is the correct figure. This compares with 19,030,992 lb. extracted during the previous quarter. Total income for the period amounted to $1,035,749.22, of which $869,980.00 was distributed as dividends.

Australian Metal Associations and Small Mines

MELBOURNE CORRESPONDENCE

Lead, zinc, copper, and, probably, tin are now being handled in Australia by the respective "Metal Associations." They arrange all exports and sales. During the scarcity of ships, these associations have been invaluable in securing f.o.b. contracts. However, through no fault of the Associations, the owners of small mines have not benefited by these f.o.b. contracts to anything like the same extent as have the operators of large mines.

The large mines have been able to join the large smelting works, and so obtain the lowest treatment charges. The small mine cannot do so. The owner of the small mine must sell his ore to one lead works, or to one copper works, as there is today only one custom plant for each kind of ore within the commonwealth. The operating costs of smelting works have risen along with all other costs, and their charges have necessarily been raised also. The owner of the small mine finds that his own costs have also risen, and that today, in spite of the high metal prices, his margin of profit is rather less than in pre-war times. As an example, a lead concentrate of 66% lead, 20 oz. silver, 14% sulphur, and 6% zinc was worth approximately £9 13s. per ton net return at works in May, 1914, and in May, 1918, it was worth £14 15s. The percentage of increase in net return is about balanced by the percentage of increase in charges, which were £4 14s. 6d. in 1914 and are now £7 5s. 3d. per ton. The owner of the small mine needs to make a larger profit than the operators of the large mine, as his quantity of material handled and general scale of operation are so much less. His costs, moreover, are higher than are those of the large mines, as his methods and equipment are necessarily less efficient. Thus, the owner of the small mine is forced to put back a far greater proportion of his profits into development than is necessary in the case of the larger mine, as his reserves of ore are small.

The future of the Australian mining industry is bound up with that of the small mines, for they are the potential "new producers." If some of them do not become large mines, the industry is bound to languish. Investors are loath to embark on new enterprises while the effect of the "peace gap" on the prices of metals is still so uncertain. They cannot see how any substantial fall in costs and returning charges can compensate for the expected fall in metal prices.

Australian Tin Production

SYDNEY CORRESPONDENCE

A review of Australian tin production during the last 25 years shows some curious fluctuations. Thus, in 1894, with tin at £68, about 5800 long tons was won, while in 1898 the yield was only 2400 tons, although the price of tin averaged £71. The maximum amount produced was in 1906, when, with tin at £180, about 6500 tons was exported. It would seem logical for the output to vary with the price of tin; nevertheless in 1910, with tin at £156, there was a production of 4500 tons; in 1916-17, with tin over £200, only about 2600 tons was produced, and last year, 1917-18, with tin nearer £400 than £300, the production was approximately 3600 tons. The last two periods are from June 30; the others are to Dec. 31.

In the period from 1894 to 1898, tin dredging, as now practiced, was unknown. New Zealand dredging methods were tried, adapted, and gradually improved, and the alluvial ground, too poor for the old methods, became valuable. The maximum yield of 1906 marked the end of the cheap dredging and hydraulicking methods, especially in the old tin fields which were formerly hand-worked by diggers. The alluvial deposits, both virgin and old, have been gradually worked out.

With tin selling at a price in excess of £200 in 1916-17, the low yield was caused by the combined effect of increased costs due to war, and decreasing alluvial areas, as well as the absence of new fields. The increase, only 1000 tons (from 2600 to 3600) in 1917-18 indicated the maximum production of the known tin deposits, under the stimulus of record prices.

Tin at a selling price of £400 per ton meant that ground yielding only half the tin per cu.yd. was profitable as compared with the conditions in 1910. One would expect under these circumstances that many alluvial and lode mines, hitherto unworkable, would come into production. No doubt, if there were any stability to the high prices, a large amount of such ground, now idle, would have been opened. It takes time to sample and equip the low-grade deposits, and capital, on any large scale, is shy, and the continuance of high prices is uncertain.

The truancy records of the public schools in some parts of New South Wales, Queensland, and Tasmania reflect the effect of high tin prices. The local boy reckons that 1s. for a jam tin of ore is well worth the risk of the cane.

Up to this year, tin has been unrestricted in Australia. In the future, the entire tin production will be handled by one Australian firm of metal buyers. The conclusion is that without new discoveries the Australian output will fall in spite of high prices. The possibility of new tin fields being discovered in the unprospected half of the continent is good. Favorable indications are not wanting, but the prospectors are few and old.

Ray Consolidated Copper Co.

The 29th quarterly report of the Ray Consolidated Copper Co., covering the months of July, August, and September, 1918, shows that 845,400 tons of ore was milled, containing 1.602% copper. The average daily tonnage is 9189, as compared with 9690 for the previous quarter. The decrease was due to floods and the shutting down of the mill for six days. The mill extraction was 75.18%, as compared with 75.81% for the previous three months. The gross production of copper contained in concentrate was 20,358,589 lb., and the total income was $883,348.34. Dividends absorbed $1,182,884.25, leaving a deficit for the quarter of $299,535.91.

The Fourth Liberty Loan—The Committee on Mining of the Rainbow Division of the Fourth Liberty Loan took third place with $55,000,000 raised in subscriptions.

Standardization of Mining Methods V—Fire Protection for Metal Mines*

By CHARLES A. MITKE†

Various causes are responsible for the 35 active mine fires that have occurred in the Southwest in recent years. The methods used by the different companies to combat fires are likewise varied, some of the features being open to question as to their efficacy. Mr. Mitke outlines a method of protection against fires, as well as of procedure when they occur, that may be found acceptable as a standard. The subjects of fires in shafts and stations and of those in workings are treated separately. Advantages of mechanical ventilation as an aid in fire fighting are again pointed out.

FIRES are the greatest hazards encountered in the development and operation of mines. The loss of life, damage to property, and utter disorganization of regular routine which frequently accompany them make them occurrences to be dreaded by mining organizations. The period of confusion immediately following their discovery and preceding the time when an organized method of attack shall have been planned is generally the most critical, due to the lack of definite working plans; men frequently expose themselves unnecessarily and often incur serious injuries, which at times prove fatal.

During recent years there have been approximately 35 active mine fires in the Southwest. Twelve of these were shaft fires, but the majority occurred in stopes, or in drifts and raises directly connected with stopes.

Causes of Mine Fires Varied

Fires result from many causes, among which are defective electric wiring, use of candles, spontaneous combustion in pyritic orebodies, and, I regret to say, incendiarism. In this connection it might be stated that 40% of the fires mentioned above were due to this latter cause.

Fires in surface buildings were formerly the cause of many disasters underground. The fire was communicated from the building to the shaft and thence to the mine workings. In recent years, however, steel headframes and other fireproof construction have come into general use, and timber connections between buildings and shaft collars have been avoided. A convenient water supply is always available, and the possibility of a mine fire from this source has practically been eliminated.

Friction, due to moving ground, intensified by caves and extreme pressure, is often the cause of fire in ores containing considerable pyrite, chalcocite or chalcopyrite, and recently it was demonstrated that a fire can exist in sulphide ores the sulphur content of which is approximately 3%. Fires in metal mines have become so frequent that almost every district has its history of them, and most companies are now taking precautions to meet such emergencies when they arise.

Various methods of fighting fires have been employed at the different mines with more or less success. The plan most generally resorted to in the past has been that of sealing up the fire or fire district, and allowing it to remain for a considerable length of time, extending in some cases over a period of years, while this portion of the workings was temporarily abandoned. This has proved fairly successful in mines containing large areas of low-grade ore, but where the mine is a high-grade producer, the removal of a large portion of the orebody from active stoping, even if only temporarily, would seriously curtail production.

At one mine, a complete mine-fan equipment has been installed on the lowest level, which may be started in case of fire by entering the workings through an adjoining mine. This, in addition to a fire-fighting equipment, consisting of portable blowers, ventilating pipe, bratticing, helmets, etc., together with a set of rules prescribing duties for the organization, makes up the fire-protection system.

Another company places entire reliance on teams of trained helmet men. It is expected that these will be able to cope successfully with any emergency which may arise.

A third mine has a system of bulkheading and patrol in force. Bulkheads are put in as seals at all stopes which are not in operation. Though the seals are not airtight, they could easily be made so in case of fire. The patrol has the specific duty of visiting every working place shortly after the men go off shift. Gates are put in at tunnel entrances to the mines and are kept locked both day and night. When the shift is going on, a watchman opens the gates and checks the men, allowing only those who have time cards to enter. When the shift goes off, the watchman again takes charge. If motors are to take timber and other supplies into the mine through the gates during the shift, it is necessary for the motorman to have a key to the gates in order to pass through. Screen gates, such as shown in Fig. 1, are also put in front of important shafts, so that it is impossible for any one to get near these shafts except when the foremen and bosses go through, or when the shift is coming on or going off. In the district in which this mine is situated there have been a number of incendiary fires which have necessitated these extreme measures.

Each Man's Duty Specified in Case of Fire

At a fourth mine a set of rules is in force which governs the actions of practically every man employed, from the one who discovers the fire right up through the organization to the operating department. For example: A miner discovers fire. He reports to the cagers, who in turn report to the hoisting engineer. The hoisting engineer telephones central and also the power plant, which flashes a general alarm and shuts off the mechanical ventilation. Central notifies the elec-

*The fifth of the series of articles which began in the Nov. 9 issue of the *Journal*. Copyright, 1918, McGraw-Hill Co., Inc.

†Mining engineer, Bisbee Arizona.

trical, mechanical, safety, supply, and operating departments. Having notified the hoisting engineer, the cagers proceed to close all fire doors and turn water into the compressed-air lines while on surface. They then visit the different levels to see that the doors are shut, while the men who have received the alarm are coming to the shaft stations, there to be checked off by the shift boss. By this time, the men of the operating department arrive and take charge of the situation. Aside from these definite instructions to individuals, there is a complete supply of fire-fighting equipment always on hand in the mechanical department, and oxygen helmets and pulmotor are kept in stock, ready to be transported immediately.

At another large mine, signals are given on the lights, calling the men to the shaft stations, there to await orders. Refuge chambers are provided by means of drifts in dead ends on certain levels, where men may enter, close the door and turn on the compressed air and thus remain until the rescue party calls for them, if they are unable to leave the mine.

At practically all mines there are hoses and connections at the collar of the shaft so that a stream of water may be turned into the shaft in a short time. In some places a water line is run around the collar of the shaft so as to distribute the water properly. There is a possibility, in case of a fire, of the water not reaching it immediately by this method.

Methods Used Questionable in Some Ways

Some of the features of these fire-protection systems which are in use at the present time are commendable, while others are open to criticism. Merely turning a water line into the collar may not necessarily extinguish a shaft fire, as the water may not come in direct contact with that part of the shaft which is burning. On the other hand, a series of sprays placed at regular intervals in the shaft distributes the water in such a manner that every portion of the shaft becomes soaked in a few minutes.

Automatic sprinklers, which have been used to much advantage in buildings, are not suitable for use in shafts. These sprinklers operate when the heat of the fire becomes great enough to melt a plug, the removal of which allows the water to flow. They are extremely dangerous in shafts where there are no fire doors, for if a fire breaks out in the shaft, all the sprays begin to operate at a certain temperature and are not subject to control. This changes the draft and forces the smoke and gas into the workings, thereby endangering all the men in the mine. Consequently, if sprays of this character are to be used, they should be controlled by a valve on the surface and should be connected to a separate water line installed for this purpose.

Refuge chambers have been used to advantage in coal mines in case of explosion, but their value in metal mines is questionable, as the men have to depend on the compressed air which is piped into the chamber. Should a small cave occur near or over the compressed-air line, the pipe may be damaged and the supply of air cut off. In fact, it becomes necessary at times to turn water into the compressed-air line in order to put water on the fire, which, of course, necessitates turning off the compressed air entirely.

Chemical engines have been suggested for employment at mine fires. However, their use is accompanied by serious danger, which is apparent when one considers the large volume of gas—at least 100 cu.ft.—which is released with one charge. On the surface this would be diluted without danger to any one, but underground, it is merely another menace added to that of the gas produced by the fire.

Helmet Work Requires Careful Planning

Though helmet men are relied upon entirely at some camps, their work should always be mapped out with great caution. They should be sent into smoke or gas but a short distance. Only a limited amount of work can be expected of them, as a man wearing an oxygen helmet does only about 20% of the amount of work that he would do when working in good air without the apparatus.

Various forms of fire alarms have been suggested, such as turning off the compressed air, flashing an alarm over the electric wires, etc. The disadvantages of these are that the compressed air frequently goes off during the shift, due to other causes such as minor troubles at the power plant, and that in many cases electric wires do not extend into distant workings.

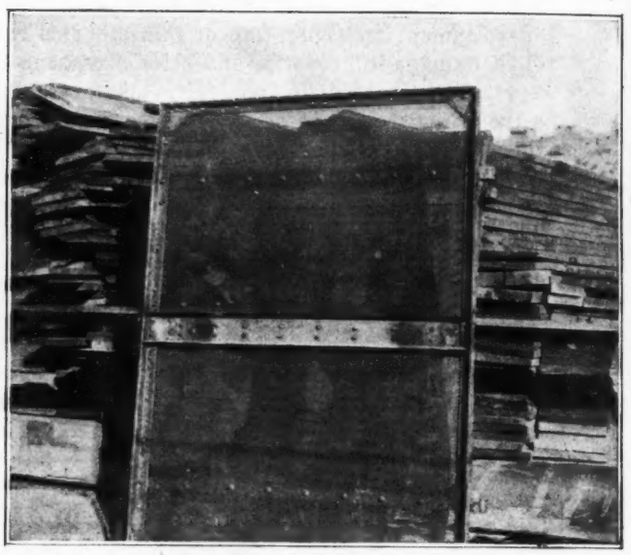


FIG. 1. TYPE OF SCREEN GATE USED IN FRONT OF IMPORTANT SHAFTS

Many working shafts are now being fireproofed by means of concrete or gunite. This is most effective but quite expensive and is not justified where the life of the shaft is comparatively short.

Standard Method Outlined for Protecting Shaft and Stations

All timbered shafts should have spraying systems installed. These act not only as a means of fire protection but may also be used to preserve the timber in dry shafts. Spraying systems should be placed in the shafts and shaft stations. They consist of a main water line, extending from the surface to the lowest level, with lines of spray on the dividers between the shaft compartments and above the timbers in the stations. The number of lines of sprays will be determined by the number of compartments in the shaft, a two-compartment shaft requiring only one line, and a three-compartment

shaft two lines. The sprays, of the lawn-sprinkler type, should be placed about 25 ft. apart in the shaft and 10 ft. apart in the stations. Branch water lines, 1 in. in diameter, should connect the main line with the sprays. Small valves should be placed between the sprays and the main water line to permit regulation of the water at will. The system as a whole should be connected with the main fire-water line by a valve on the surface, from which it may also be controlled.

In case of fire in a shaft, should water be turned in, the smoke and gases are apt to be carried into the workings, as stated before, thus endangering the lives of the men. To avoid this contingency, wooden fire doors should be placed a reasonable distance from the stations, so that the draft can be controlled. Such doors serve to separate the shaft from the rest of the mine workings and should always be closed in the event of fire in the shaft.

Purpose of Fire Doors to Check the Draft

Iron fire doors have been in use at many mines for a number of years, but the wooden door has proved equally satisfactory and much more economical. The purpose of all fire doors is primarily to check the draft and not to stop the progress of the fire. Should an iron door be subjected to intense heat it would warp and the draft pass through unchecked, thereby exposing the men to dangerous gases. Wooden doors should be installed far enough from the shaft so that some time will elapse before the fire reaches them.

Fig. 2 is a drawing of a wooden door, which is comparatively air-tight. It is made of double 1-in. boards with roofing paper in between, and is designed to fit against a set of timber and not into a frame. Otherwise any sag in the door or the frame or any swelling of the wood would prevent the door from closing properly. It is important that all doors should be hung in this fashion and merely overlap the timbers a distance of about 2 in. A 2-in. strip of canvas should be nailed on the timbers to make an air-tight joint.

Around the set on the sides and the back should be built a concrete stopping 8 in. thick. In the bottom of the drift no concrete should be used, but it should be built up with timber to about 2 in. above the rail, grooves being cut for the car wheels to pass. Standard iron handles should be made and heavy strap hinges used; also pulleys with 15-lb. weights to pull and hold the door tightly shut when closed.

Shaft Doors Provided With Air Control

An air control, as shown in Fig. 2, should accompany each door. This is a simple and inexpensive device and affords accurate control. A 1-in. air line should be put in each shaft and connections made from it to each fire door of that particular shaft. If it be desired to close the doors on each level, a valve is shut on the surface, cutting off the compressed air, and a release valve opened, which automatically closes all the doors. These valves should be placed near the collar of the shaft, so that no time may be lost when an alarm is given.

It is important to keep the automatic closing device in good repair, as otherwise, in the event of fire, it would be necessary to send a man down to make sure that all doors had shut when the release valve was opened. An electric control of the doors would answer the same purpose admirably, but would cost more. Once closed, either by air or electricity, the doors can be reopened only by hand.

Fire extinguishers should be kept in the stations for immediate use in case of an outbreak of fire in the station or adjacent heavily timbered drifts.

Fire Rules Should Be Posted Near Collar

A set of rules, similar to the following, should be posted on the surface near the valves which control the fire doors and spraying system, governing the actions of the men and the steps to be taken in case of a fire in the shaft:

First—Notify all men in the mine to go to a place of safety at once.

Second—Close the valve in the air line and open the release valve. This will close all fire doors.

Third—Open the water valve connected with all the sprays.

Mine telephones should be installed at important points, as they facilitate getting the men to a place of safety in the shortest time, though it is better to get all men out of the mine in case of a shaft fire. The prompt closing of the fire doors will prevent smoke and gas from entering the workings and allow an immediate attack to be made on the fire. The men will have sufficient time to make their exit through another outlet before the small amount of gas which may leak through the doors overtakes them.

Fighting Fires in Workings More Complicated

In the event of a fire in the mine workings, one of the most serious difficulties is that of removing all the men before the workings become filled with smoke and gas. For this reason it is necessary to provide means of giving a general alarm, so that all men underground may he warned as quickly as possible. Instructions should be given that upon the discovery of a fire the different sections of the mine should be telephoned and the alarm spread, and that the foreman and shift bosses be notified immediately. The men, upon warning, should go at once to the shaft station, where the shift bosses should check them and see that all have arrived.

As soon as the foreman is notified, he should take charge of the situation, instruct one man to telephone the mine office, have another put in the emergency call for the cager, and send others to the different working places to make sure that all the miners have been called to the shaft stations. He should then investigate the nature of the outbreak to decide how many men he will need to fight the fire and how many should be sent to the surface.

The mine office, as soon as informed, should notify all departments—supply, mechanical, electrical, pipe, safety, and operating departments. The cager should go to the level where the foreman is collecting his men and hoist them as fast as possible if it is found necessary to leave the mine. His duties should be to obey the foreman. It should also be understood in the organization that in case of fire, and until the arrival of the superintendent, the mine foreman should take charge of the situation, and, in his absence, the assistant mine foreman, and should he be away for any reason, then the senior shift boss. If it is found necessary to leave

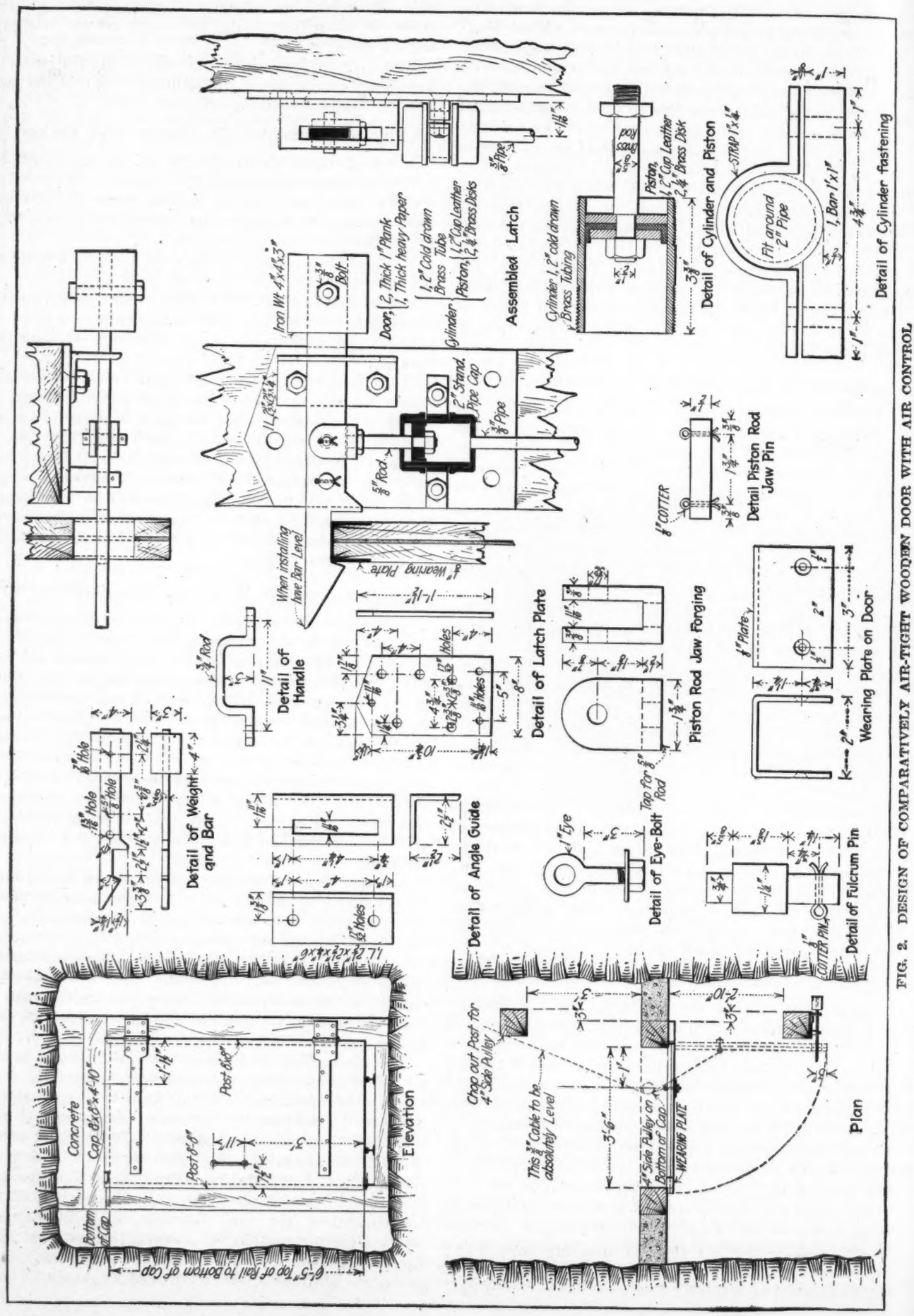


FIG. 2. DESIGN OF COMPARATIVELY AIR-TIGHT WOODEN DOOR WITH AIR CONTROL

the mine, the men should follow the regular routine and report to their timekeeper, who will check up the shift and advise the foreman if any are missing.

The compressed air should not be turned off and water turned in unless it is thought advisable by the foreman or superintendent. The same rule should apply to the ventilation. No change should be made in this except in case of fire in the shaft. Great care should be exercised in mines ventilated by mechanical means. It is seldom necessary to close down the mine fans; in fact, it is usually dangerous to do so, as the men are all accustomed to the general direction of the air currents, and, if these are changed, they are likely to go into dangerous places which were perfectly safe while the fans were running.

Fire-fighting equipment should be kept on hand at all times and ready for immediate use. As soon as it arrives, an effort should be made to extinguish the fire by putting the fire district under pressure, building brattices, etc. If the fire proves too big for these emergency measures, then a definite system of attack should be worked out under the direction of some one experienced in this line of work.

Equipment Should Include Fans and Blowers

Fire-fighting equipment should consist of one or more three-foot disk fans, and several 10-in. blowers, connected to 2½-hp. motors (fan and motor mounted on one base). These are necessary for providing mechanical ventilation in fighting the fire. All fans may be mounted on trucks so that they can easily be transported to the place where they are to be used and electric connections made. A roll of canvas or roofing paper should be kept on hand for bratticing; also about 300 ft. of 10-in. ventilating pipe for the blowers; 200 ft. of hose; 100 sacks of cement and sand; about 100 ft. of metal lath, 6-in. wide, which is to be used for bulkheads; and a supply of 1-in. boards, 10-penny nails, long 10-ft. nozzles, helmets, and a pulmotor.

The storage-battery blower has not proved successful as an aid to fire fighting. In the first place, the volume of air produced by the small blowers is of little consequence when attacking a large mine fire. The storage battery with blower complete is very cumbersome, especially when it is necessary to move it from one level to another. It has been found that small electric blowers, which can be transported from level to level within a few minutes, may be attached to the wires by electricians and put in operation in far less time than the storage battery kind. Moreover they can be kept in operation continuously, whereas the life of the storage-battery blower is limited.

Mechanical Ventilation Useful in Fires

The advantages of mechanical ventilation as a means of preventing mine fires is apparent on noting that the cost of fighting fires in mines where it is employed is about 20% of that in mines using only natural ventilation, as has been proved in all the recent large mine fires in the Southwest. Furthermore, a large number of smaller fires have been extinguished in mines where mechanical ventilation is used before they had an opportunity to develop into big fires. This would have been practically impossible in mines where the ventilation is not controlled by mechanical means.

During recent years, when exploratory work is to be done at long distances through smoke and gas, mechanical ventilation is used to clear the atmosphere as far back as the fire district. This enables the helmet crew to maintain a station in the proximity of the fire, so that attacks can be made by going only a short distance, as, for example, 50 to 75 ft., thus ensuring safety, as it is then possible for the men to come out, even though one of the sets of apparatus should get out of order. This method also permits the largest part of the work around a mine fire to be done by men without the oxygen apparatus, so that a far more rapid attack can be made. When using mechanical ventilation to fight mine fires, fewer men have been knocked out with smoke and gas than in mines having natural ventilation.

Natural Ventilation Gives Unstable Currents

Another consideration of great importance is the continuity of air currents in a certain direction when mechanically controlled, as contrasted with those in mines where no mechanical system has been installed, and where the miners are subjected to the continual change of atmospheric conditions. In all cases of natural ventilation, such changes result in reversals of air currents, depending upon the season of the year, time of day, etc.

With the mechanical system, a mine in which a fire exists may be kept in continuous operation by putting the fire district under pressure and thus obviating long delays, large expenditures and curtailment of production, frequently incurred by the use of more expensive means of extinguishing the fire.

In case of fire in the mine workings, there should be no stopping of the air circulation, save in exceptional cases, when it is absolutely certain that all the men are in a place of safety and that the fire-fighting crew will not be endangered. It is the continuous circulation which makes possible the rapid attack on a mine fire, and therefore it should not be disturbed.

Gob Fires Require Special Handling

A fire in a gob generally gives warning before it actually breaks out. Gases are given off which can be recognized as a sign of incipient or actual fire. A suspected district should be patrolled at least once each day, and if necessary, once each shift. When it appears likely that a fire may exist or may develop, the drifts and air courses should be opened to a separate exit, through which the smoke and gas may pass to the surface. Great care should be taken not to turn water into such a district intermittently. While this method has proved successful in leaching the heated ores, it has the disadvantage of generating a large amount of additional heat, which may prove dangerous to the surrounding district.

In dealing with such a problem, large volumes of air should be used continuously to cool the heated district before it actually takes fire. This is the most economical way of lowering the temperature of a sulphide fire district. If, however, the gases coming from the district indicate that fire actually exists, it is then necessary to keep a constant stream of water flowing over the hot area, while steps are being taken to mine out this material and send it to the surface. The waters naturally become charged with copper, and their acidity frequently damages the pumps and water lines as the

water is pumped to the surface. In such cases, large quantities of iron and lime have been used to remove the copper from the water and neutralize the acid. However, the returns from the salvaged copper are usually far less than the damage done by such acid waters.

Doors should separate adjoining mines, so that a fire in one will do no damage in another. Old workings should be sealed off with screens instead of airtight bulkheads. This will allow free circulation and prevent rapid decay of timber, which results in caves.

In general, at least 10 ft. of ore or waste should be kept in all chutes. In case of fire from the stope above dropping into the chute, it can thus be checked before it burns out the bottom of the chute and caves in the entire drift beneath.

Arrows, marked "This Way Out," should be placed in all important drifts, pointing to another exit which is to be used in case the main shaft may not be used, owing to fire. This presupposes the existence of certain drifts and manways which are to be kept in good repair so that the men can climb to the surface in an emergency.

From time to time there should be conferences between the mine superintendent and his foremen and bosses, at which the question of fires in the different parts of the mine should be discussed, so that in case of emergency there will be no confusion, but each foreman and boss will know exactly what to do.

Westinghouse Electrical Equipment For Cottrell Plant

In refineries of different types there is always a possibility of some valuable byproduct being lost in the gases ascending the flue. This is particularly true in the metal-treating field, where it has now been found possible to save solid and liquid particles from the flue gases by an electrical process. This consists in passing the gases through tubes in which are suspended chains charged with high-voltage direct current, whereby the particles carried by the gases become electrified and are projected against the walls to the tubes. These tubes are grounded and thus the particles drop into hoppers below. Mechanical rectifiers convert the low-voltage alternating current into direct current.

An interesting application of this process was recently made in a copper refinery. In this particular installation there is another noteworthy feature—the size of the generating and transforming unit used. In plants of this type the electrical equipment is usually split up into a number of small units, but in this case all the current is handled by a single generator and transformer, although a duplicate set has been installed for emergency purposes. With this arrangement there is a sacrifice in flexibility of operation; but the use of large units makes the installation simpler and more compact. In all probability both arrangements will find a field where they are best suited.

The tubes containing the high-tension electrodes and through which the flue gases pass are arranged in six groups. The electrodes are suspended at the top from a rack which provides ample insulation, and are connected with the high-tension direct-current line at the bottom. Disconnecting switches permit the current to be cut off from any group during inspection and repairs. The gases from the furnaces pass through pipes 13 ft. in diameter, a Y, with valves, being provided so that the gases can be made to go either through the treater or directly to the stack, as desired. Tests show that over 90% of the flue dust can be removed, and that the value of the copper, zinc, and other metals recovered will within a short time pay for the treating equipment. It is calculated that at full load ½-ampere high-tension direct current is needed.

The generating equipment consists of two 40-kva. 60-cycle, single-phase Westinghouse generators operating at 1800 r.p.m., arranged to deliver voltage of from 150 to 250 volts. A direct-current power line supplies excitation current. A 50-hp. 230-volt, direct-current motor drives each generator. The transformers are of 40 kva. capacity, 200 volts low tension, and 100,000 volts high tension. Additional taps are provided, from which voltages of 50, 62½, 75 and 87½% of the maximum can be obtained, the full capacity of the transformer being available on each tap. The high-tension leads pass out from the transformers through condenser-type bushings, which are made up of alternate layers of metal foil and insulating material, and provide a higher degree of insulation than can be obtained from any other form of construction of the same diameter. Choke coils are located inside the transformers to smooth out the static surges liable to occur on the high-tension line. To the motor-generator shafts are coupled the rectifiers for transforming the high-tension alternating current into direct current.

The Westinghouse switchboard consists of two panels, one for each generating and transforming set. Each panel carries, from top to bottom, a circuit breaker on the line between the generator and transformer, an alternating-current ammeter and voltmeter, a switch to reverse the polarity of the high-voltage direct current, a motor field and line switches, a generator field rheostat, a five-point switch for making connections with five high-tension taps of the transformer, and the motor-starting rheostat.

The voltage of the high-tension direct current must be varied according to the condition of the flue gases being treated. The transformer taps provide the large steps for this variation, and the voltage adjustment of the generator the small steps. In addition, a bank of adjustable resistance is connected in series with the low-voltage alternating current, which acts as a ballast and permits of further adjustment of the voltage. These banks are situated on each side of the switchboard. Resistance is also provided in series with the high-tension direct-current line by resistance tubes mounted above the rectifiers.

Under ordinary operating conditions, the motor generators, as described, are employed so that there is no direct connection between the high-tension direct current and the power lines of the plant; but, in case of emergency, current from the alternating-current lines can be fed into the transformers and used to provide the high-tension operating current. Under such circumstances the rectifiers driven by the generators cannot be used, so in their place are employed auxiliary rectifiers driven by 2 hp. Westinghouse synchronous motors, which keep the rectifiers in synchronism with the current being rectified.

The Fluorspar Market and the Local Supply

By A. L. SWEETSER

The aim of this paper is to awaken interest in the development of deposits of fluorspar which are known to exist in various parts of the country. The total production and commercial uses are described in detail, as well as the prevailing prices and the various industrial requirements.

FLUORITE, or, as it is commonly called, fluorspar, is the fluoride of calcium. Various industries last year consumed over 197,000 tons of fluorspar, an amount far greater than was produced in the United States. There are only six states now producing a commercial tonnage steadily. Isolated, undeveloped deposits are known to exist in northern New York, Vermont, and New Hampshire, yet, so far, the latter state is the only one in this vicinity that has produced a steady tonnage for the market.

Owing to the difficulty of importing fluorspar because of the war, a search for possible local deposits has created considerable interest in this non-metallic mineral. A brief description of data gathered during a recent visit to these known deposits of New York and New England should prove of interest and help in locating other similar deposits.

From a hurried examination of the outcrops in the vicinity of these deposits, it appears that the ridges surrounding them are of hornblendic gneiss, with a few included bands of pyritic schists and crystalline limestone with a series of intrusives ranging from granite to the basic varieties. The mineralized beds are for the most part covered with a two-foot layer of gravel and a three-foot granite rock capping, under which is found the fluorspar associated with calcite in such a manner as to indicate that it is of an aqueous igneous origin.

The mineral is crystalline, slightly harder than calcite, and crystallizes in the isometric system, and it is found usually in cubic crystals. In color, fluorspar varies according to purity, from a clear, glass-like, white, through various brilliant shades, to dark purple.

The ore usually occurs in irregular lenticulated masses. Small veins are found along fissure planes, where these occur, and such veins are called contact veins. In general the strike is northeast or southwest, but the dip varies greatly, anywhere from zero to 40°, depending upon the locality. Samples of the three characteristic crystal colors, taken at various places, analyzed as follows:

PERCENTAGE ANALYSES OF NEW ENGLAND FLUORSPAR

	Purple	Pink	White
Fluorine	45.85	47.81	48.15
Calcium	50.21	47.72	49.90
Silica	.71	.90	.81
Magnesia	.24	.18	.19
Alumina	.18	.79	.18
Manganese	.14	.09	.05
Iron	.47	.42	.27
Undetermined	2.20	2.08	.45
	100.00	100.00	100.00

Theoretically speaking, a pure crystal of fluorspar should contain 48.9% of fluorine and 51.1% of calcium.

The prevailing method for handling the ore, after breaking, is to clean it by means of log washers, gravity washers, washing trommels and automatically sprayed vibrating screens, whence the material is dumped on a belt conveyor for hand picking. The log washer is preferable for dirty material, though the sprayed vibrating screen is to be preferred if a cleaner product be desired.

A detailed description of milling methods for fluorspar as now practiced in the Southern and Western states will be found in Chapter V, Bulletin 9, of the Kentucky Geological Survey, which gives a well-illustrated description of such washers and mills.

Metallurgical, Chemical and Industrial Uses

For several years fluorspar nas been extensively used as a flux, because of the fact that it saves from 2 to 5% more iron than is possible when lime alone is used for this purpose. Fluorspar also acts as a reducer of the sulphur and phosphorus content of iron and steel and increases the tensile strength. Several hundred iron. steel, and brass founderies are now using fluorspar as a flux, and it is widely used by companies in other than metallurgical lines.

The demand for fluorspar is greater than the amount produced in this country. Domestic production is, so far, confined to Illinois, Kentucky, Tennessee, Colorado, New Hampshire, and New Mexico. The production in 1917[1] was 195,000 tons, or 94% of the total amount consumed, 6% being imported, the material being shipped from England, as ballast, on returning vessels. Approximately 85% of the gravel spar is consumed as a flux in basic openhearth steel furnaces and in other branches of metallurgy. Of the ground product, 57% is used in the chemical industries and 21% in the manufacture of glass.

In addition to its use as a flux, fluorspar is valuable in the production of alumina by the Hall process and in the electrolytic refining of antimony. When combined with carbon electrodes, the lighting efficiency is increased and the current consumption reduced. If mixed with feldspar and cement dust, the volatilization of potassium is increased.

Fluorspar Crystals Utilized in the Manufacture of Lenses

Because of its low refractive and dispersive powers, the crystals of fluorspar have been used as apochromatic lenses in the manufacture of telescopes and spectroscopes. The chemical applications include the manufacture of aluminum fluoride, iron fluoride, sodium fluoride, ferromanganese, ferrosilicon and the production of hydrofluoric acid. Fluo-apatite is made synthetically by fusing fluorspar with sodium phosphate.

Fluorspar is also employed in the manufacture of cheap jewelry, paper weights, enamels, and glazes for pottery and kitchenware and as a bonding material for emery wheels. When used with feldspar in the manufacture of glass, the product has opalescent qualities.

[1]Congressional Record, April 23, 1918.

The tonnage consumed in the United States per year for seven years previous to entering the war, according to the authority quoted, is as follows:

CONSUMPTION OF FLUORSPAR IN THE UNITED STATES
(In long tons)

	Domestic	Imported	Total
1910	69,427	42,488	111,915
1911	87,048	32,764	119,812
1912	116,545	26,176	142,721
1913	115,580	22,682	138,262
1914	95,116	10,205	105,321
1915	136,941	7,167	144,108
1916	155,735	12,323	168,058
1917	195,000	2,695	197,695

Especially fine specimens of fluorspar, showing the structure, are sold for mineralogical collections in museums, colleges, and other exhibition purposes, and often bring as high as $60 per ton. The nominal prices, as quoted in the Nov. 15 issue of *Chemical and Metallurgical Engineering*, were $28 to $40 per ton for gravel fluorspar, f.o.b. mines, and $90 per ton for the best grade washed and pulverized.

The percentage of calcium fluoride and the objectionable impurities in the three chief grades are as follows:

CONTENT OF CHIEF GRADES OF FLUORSPAR

	Content	Per Cent.
Acid grade	CaF_2	98
	SiO_2	1
	$CaCO_3$	.5
Fluxing grade	CaF_2	95
	SiO_2	2.5
Metallurgical grade	CaF_2	85
	SiO_2	5
	$CaCO_3$	5

Lubrication of Air Compressors

By W. H. Callan*

The lubrication of the compressor, steam cylinder, main bearings, crankpin, crosshead pin and crosshead guide does not differ from that of the ordinary steam engine, which is well known and understood. This article therefore will be confined to a discussion of air-cylinder lubrication.

Some years ago I experienced considerable trouble in securing a suitable oil for the lubrication of compressor air cylinders. The matter was finally taken up with a well-known oil company, which, after examining conditions, reported that the oil being used was too light in body and of too low a viscosity to withstand the high heat of the compression, being gasified by the high temperature of the air, and passing off in vapor, leaving the cylinder wall without lubrication. Thereupon an oil which it was thought would be suitable was recommended. This particular grade was of 26° gravity Bé., with a flash point of 515° F., fire-test temperature of 555° F., and a viscosity of 130 S. at 212° Fahrenheit.

After it had been used for some time no improvement was to be noted in the operation of the machine, and the temperature of the discharge air was still high. The cylinder heads were removed, the valves taken out, and an examination was made. The cylinder wall seemed to have a sticky, plastic coating; the air passages and discharge cavity showed signs of dark deposits, and the face of the valve seats was covered with a black, hard coating. This hard formation caused leakage of the valves and increased the temperature of the discharge air. The sticky coating on the cylinder wall was responsible for the increased friction. It was then suggested that lighter oil be tried, and one with 27½ gravity Bé., flash point 450° F., burning point 500° F. and a viscosity of about 125 S. at 212° F. was recommended.

After a period of operation with this grade of oil, examination showed that though the cylinder wall appeared less foul, the valve passages and discharge cavities of the cylinder were coated with a hard deposit, which was thought to be due to the feeding of the oil, and it was suggested that the amount fed into the cylinder be reduced. This was done with great care, until only three drops a minute in a 14 x 14 cylinder, running at 150 r.p.m., were being fed, but even then the deposits in the valve passages and the discharge cavities of the cylinder continued to form.

The reason given for the coating in the passages was that the residuum of all oils is carbon, which was assumed to be responsible for the deposits. Upon recommendation, the use of this oil was still continued, although the formation in the discharge passages seemed to be building up rapidly, despite the fact that a small quantity of oil was being fed into the cylinder, and soon collected to such an extent that it was necessary to clean the passages in order to avoid the hazard of an explosion. After the passages were cleaned, some of the material that had been removed was analyzed and found to contain 1.5% free oil, 11% rust, 5% decomposed oil, 30% mineral ash, 10% coal dust, and the remainder foreign matter, or residuum. A further investigation revealed the fact that the intake was exposed to such material as coal dust, mineral ash, shavings and water, as well as some air.

After cleaning the compressor, and safeguarding the intake against dirt and dust, another grade of oil was procured. The new oil was of gravity 31 Bé., flash point 375° F., burning point 420° F. and with a viscosity of 200 S. at 100° F. At the beginning, the feed amounted to three drops a minute, but this was later reduced to two drops a minute. The compressor was operated in this condition for considerable time with practically no trouble from carbon deposits. The good results from the light oil led to a disbelief in the virtues claimed for low-gravity, high flash point and heavy viscosity oil, and another grade having a gravity of 33 Bé., 330° F. flash point, fire test of 420° F., and a viscosity of 140 S. at 100° F. was tried. Feeding two drops a minute in a 14 x 14 cylinder running 150 r.p.m., this oil was used for years without trouble resulting from faulty lubrication, valve leakage or carbon deposits.

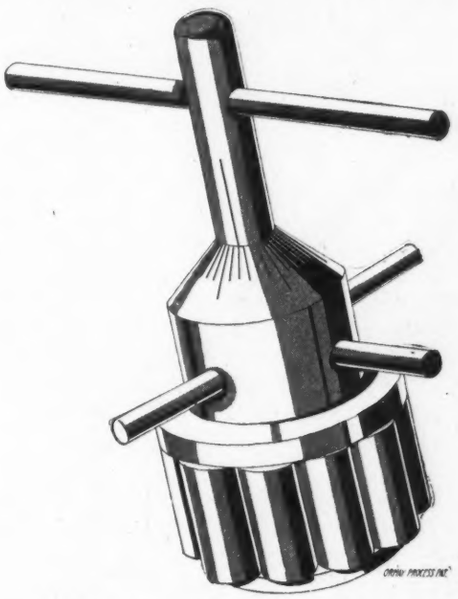
*General manager of plants, Chicago Pneumatic Tool Co., Chicago.

Motor Truck Service Recorder

An instrument to record the working hours of a motor truck or other similar vehicle has recently been brought out by the Service Recorder Co., of Cleveland. The device takes advantage of the side-sway developed when a vehicle of this class is in motion, and consists, essentially, of a pendulum mass which will swing from side to side in response to the side-sway of the moving vehicle, and a chart rotating at clock speed, upon which the pendulum can mark a record, and hence denote when the vehicle is in motion. Of course, absence of this record shows that it has not been used. The pendulum records its oscillation on the chart by means of a stylus set near its point of suspension.

Rolling Babbitted Bearings*

The hardness of babbitt by the Brinell test shows practically no change after compression, and it may be concluded that the various methods of finishing babbitted bearings, such as peening, broaching, and reaming, do not improve the hardness of the babbitt. As, after these operations and the final scraping, it is still necessary to make a test run of bearings until the shaft



ROLLER FOR BABBITT BEARINGS

is seated, it seemed possible to introduce improvement in the usual method of procedure. The so-called glass-like surface of old bearings is considered desirable. Even if the babbitt is no harder than when cast, all inequalities of the surface have been smoothed out, and friction has been reduced to a minimum. It seemed probable that, by a rolling or burnishing operation, this desirable finish could be given to babbitt linings so that a machine could be operated at full speed as soon as finished, without a trial run.

A tool, illustrated herewith, designed by I. Mills, appears to be capable of doing this work satisfactorily. It was made for securing a better seat for the ball-bearing races of a small aëroplane wireless generator. A variation of 0.0007 in. (0.018 mm.) was found in the bearings, which could not be corrected by reaming or machining. With this tool, the seats in the aluminum alloy end brackets can be rolled to suit the individual variations of the ball bearings. A girl does the rolling, and the bearings can then be inserted or removed with the fingers. If the work is done by reaming, bearings may fit tightly at first, and after having been taken out may be quite loose, because burrs and similar irregularities have been removed.

Although the Mills micrometer roller has been made only in a small size as yet, it can be made in larger units and would then be capable of exerting much greater pressures. The present instrument is made for a diameter of 1¾ in. (4.45 mm.) and has a range of 5 mils plus and minus. It consists of 10 rolls which can be expanded by a micrometer screw through the medium of two tapered cylinders which give a parallel outward movement to the rolls. The essential feature of the instrument is that the rolls are not equally spaced, as this would cause them to flute the rolled surface.

*Excerpt from a paper presented at the Milwaukee meeting of the American Institute of Mining Engineers, October, 1918.

Temperature Trip Circuit Breaking

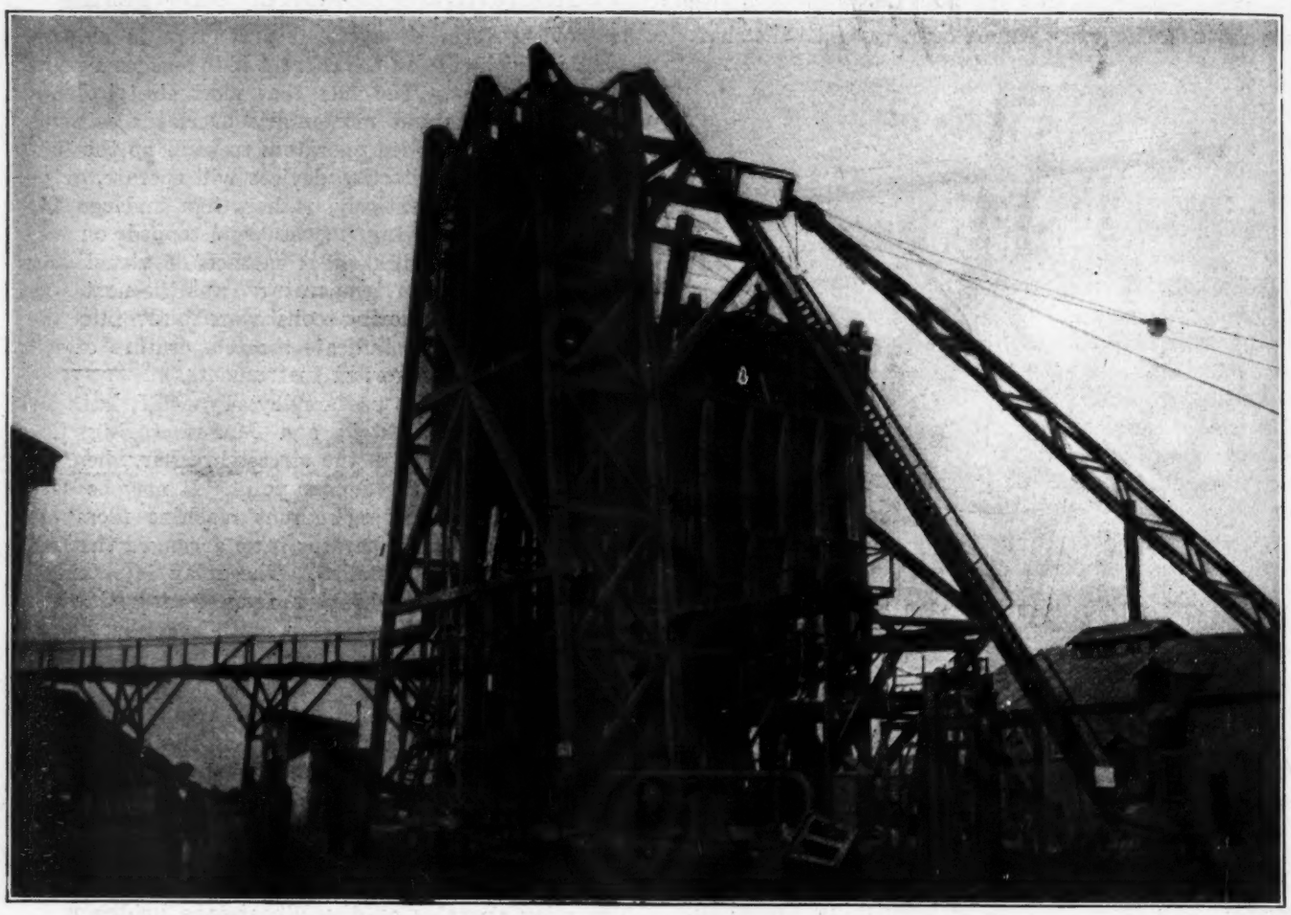
The oldest form of overload protection is electromagnetic, which cuts off the current if it reaches a point deemed dangerous. The fact that most electrical apparatus can withstand momentary overloads without danger has gradually led operators to push up the limits at which such protective devices will operate, or to dispense with them entirely, rather than undergo the inconvenience of having machinery stopped on account of momentary peaks. A method of visual protection, on the basis of temperature, was the next step toward control. Exploring coils were built into the apparatus and used to indicate the temperature of hot spots by means of electrical instruments.

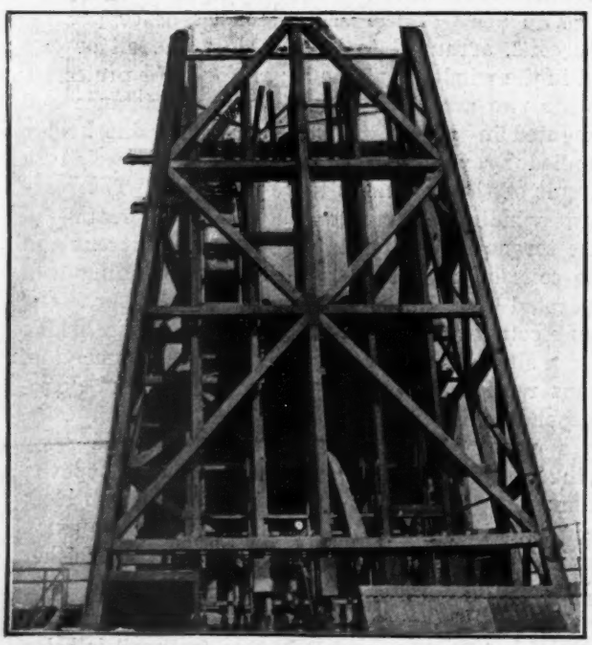
The latest plan is to use a relay, Type CT, built by the Westinghouse Electric and Manufacturing Co., which automatically trips the circuit breaker when the temperature reaches the danger point. It may be used to protect any alternating-current machine from excessive heating if the apparatus is so arranged that exploring coils can be installed. The relay is intended to protect against overheating from sustained overloads. To afford this protection with the least interruption of service, the breaker should be tripped as a result of the direct effect of the temperature of the apparatus. The relay should be so arranged that it prevents the breaker from tripping if the overload is of such short duration that the temperature does not rise to a dangerous point; whereas, if the overload persists, the breaker must be tripped out as soon as the temperature rises beyond the critical degree. This is accomplished as follows:

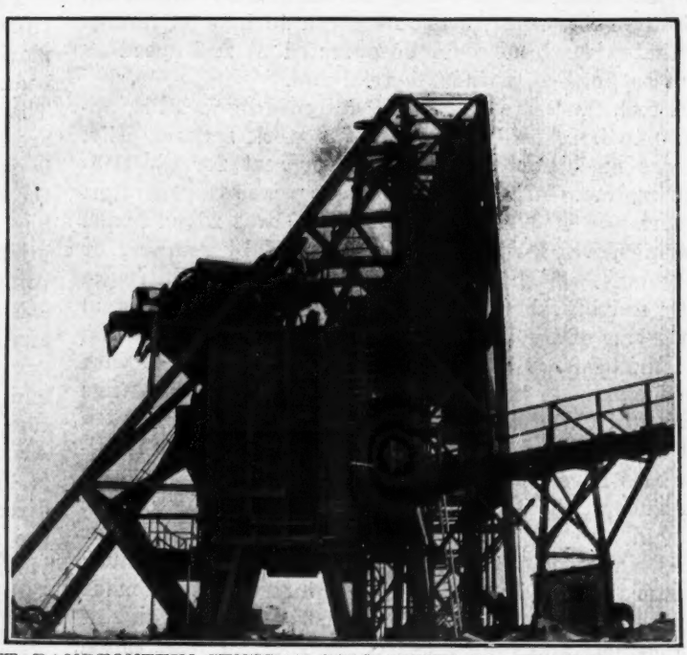
The relay operates on the Wheatstone bridge principle. Two arms of the bridge consist of copper exploring coils, arranged to be placed in the oil or embedded in the windings of the apparatus to be protected. The other two arms are of unchanging resistance and are mounted in the relay. The current for the bridge is supplied by the current transformer connected in the circuit of the apparatus to be protected. The relay has two windings, corresponding and coöperating to produce torque in a manner similar to the current and voltage coils of a wattmeter. The main winding is a coil operated directly by the current transformer. The auxiliary coils are connected to the Wheatstone bridge arms in a similar manner to a galvanometer connection, and thus receive current of the magnitude and direction depending on the resistance of the search coils. Above a certain temperature the torque of the relay is in the contact direction, and below in the opposite direction. It will thus be noted that in order to close the contact, two predetermined conditions must exist, viz., excess current and excess temperature. Neither one alone will separately trip the relay.

Production of Platinum and Palladium in Brazil is being stimulated. Official proclamations have been issued in the now quiescent placer districts of Minas and Goyaz.

Photographs From the Field

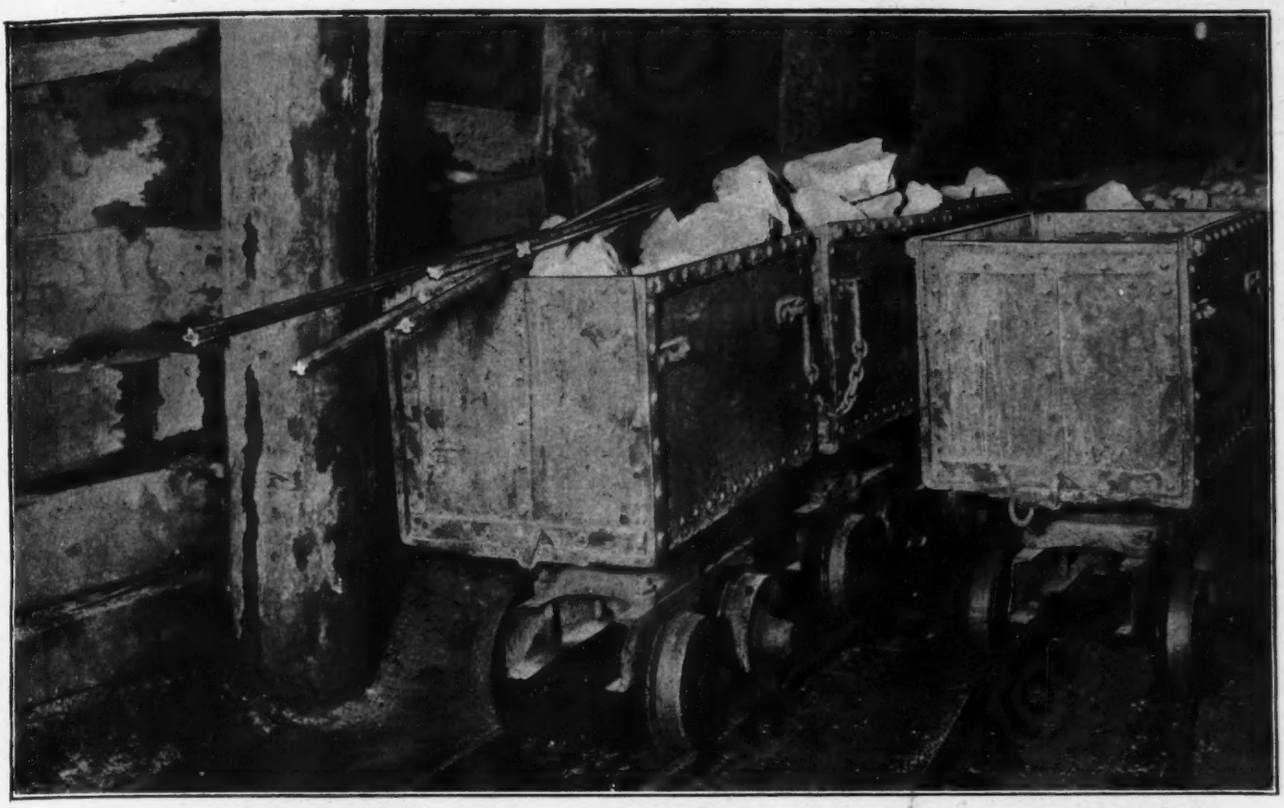




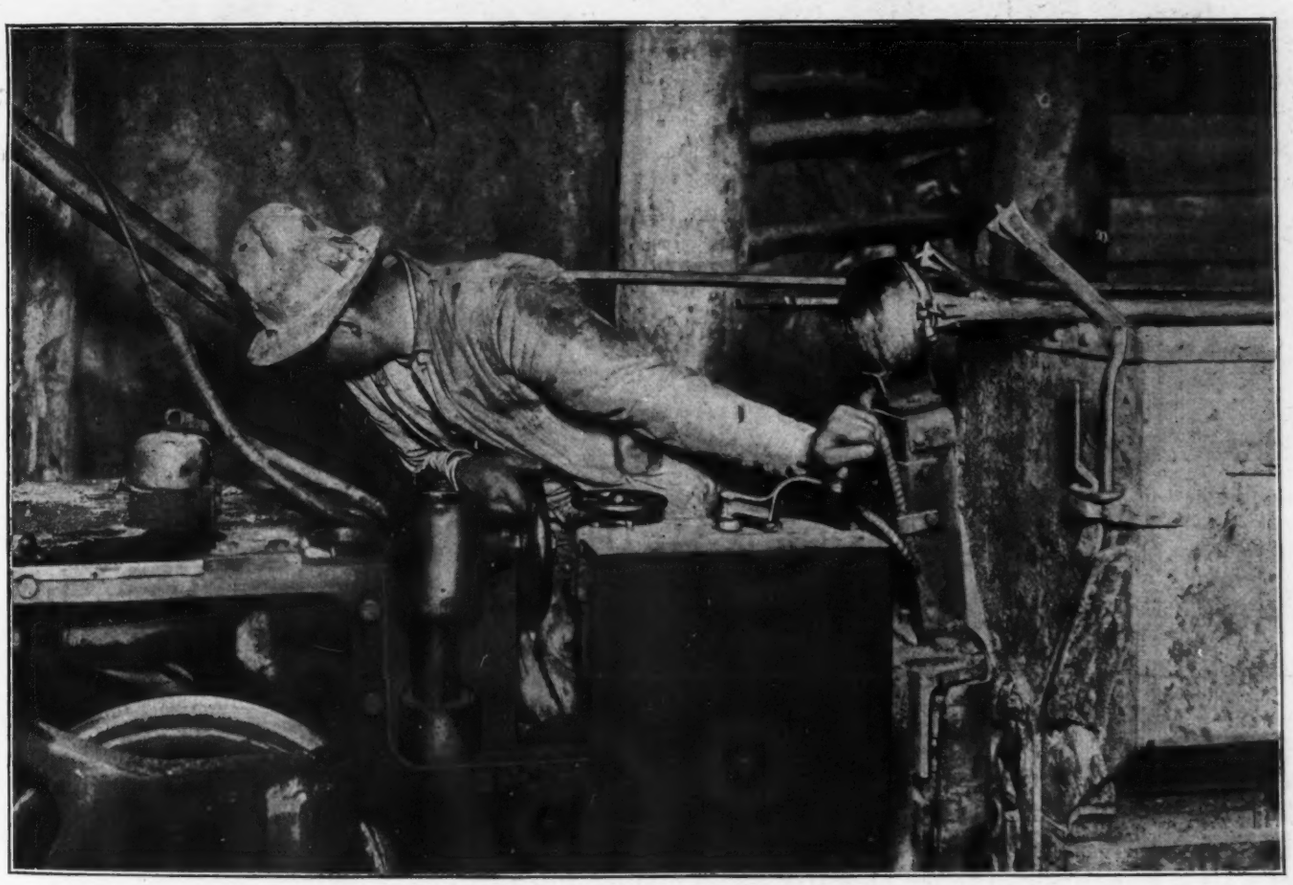


THE EFFECT OF A HOIST OVERWIND AT NO. 8 SHAFT, RANDFONTEIN CENTRAL GOLD MINES CO., TRANSVAAL

The overwind device acted too late, and the entire top of the headgear, with three sheave wheels on 14 x 14-in. timbers, was lifted bodily into the ore bins, and the skip returned to the tipping place. The picture on the left shows the skip returned to the tipping point after decapitating the headgear, and that on the right shows the top of the headgear in the ore bin.



UNSAFE PRACTICE IN CARRYING STEEL OR LEAVING IT AT UNDERGROUND STATIONS OR SWITCHES



THE ABOVE CARELESSNESS RESULTED IN INJURY TO A MOTOR MAN

These photographs, illustrating unsafe practice, are published through the courtesy of the Bureau of Safety of the Anaconda Copper Mining Co. Reproductions appeared in the October issue of the *Anode*, the company's safety publication.

Universal Membership
The Goal of the Red Cross Christmas Roll Call

The aim and underlying purpose of this campaign is to recruit under the banner of the Red Cross every loyal American, no matter where he or she may live. "A large membership in the Red Cross means more 'Over There' than money," said Chairman Henry P. Davison upon his return from a visit to every battle front. It is hoped and expected that this great ambition will be realized. It can be if every patriotic man and woman makes it his or her responsibility to get universal membership in the Red Cross. The object of the Red Cross Christmas Roll Call is to register in terms of active participation the spirit of a nation. The spirit in question is personified in Red Cross membership. Every one is urged to make it unanimous.

Joseph R. De Lamar

CAPTAIN JOSEPH R. De LAMAR, capitalist, mine owner and director in a number of important business enterprises, died at the Roosevelt Hospital of pneumonia on Dec. 1. One daughter, his only child, Alice A. De Lamar, survives him.

Captain De Lamar was born in Amsterdam, Holland, in 1848, but only the first few years of his life were spent in his native land. His bold and vigorous character displayed itself early; for, being desirous of seeing the world, he ran away from home at the age of seven years and shipped aboard an East Indian ship as cabin boy, without wages. On the homeward voyage he was promoted and given a salary of four Dutch guilders (about $1.60) per month. His first voyage completed, he continued to follow the sea, gradually working his way up through the various grades of seamanship. His early education in the elementary branches of learning—reading, writing and arithmetic—was also acquired at sea, the mates of the various ships

CAPTAIN JOSEPH R. DE LAMAR

on which he sailed teaching him, in consideration of his devoting a portion of his watches below to washing their clothes.

By the time he was 21 years old, Captain De Lamar had visited the four quarters of the globe. At the age of 23 he obtained a captain's diploma, shipped for a voyage as first officer, and returned as captain. Submarine work, or diving, being very profitable at this time, so, soon after our Civil War, he concluded to leave the merchant marine service and engage in this business. For several years subsequently he was employed in this manner, raising sunken vessels in the Delaware River, off the New Jersey coast, and at St. Thomas, West Indies. He finally established headquarters at Vineyard Haven, Mass., and continued this line of work along the coast. In 1876 he succeeded in raising a cargo of 1660 tons of Italian marble from a vessel sunk off the Bermudas many years before, on which three different wrecking parties had worked without success.

Captain De Lamar was generally successful in this business and accumulated considerable money from it. Looking around for an investment for his savings, he decided to embark in the African trade, and himself assumed charge of a vessel as master and supercargo. In this venture he again met with substantial financial success, but on account of the African coast fevers, which every year cost him the lives of several of his crew, he determined to abandon such a hazardous undertaking, and in 1878 sold his interests.

About this time precious-metal mining in the Rocky Mountains was exciting renewed attention in the East, due to the wonderful bonanzas which were just being uncovered in Leadville. Attracted by the possibilities for the accumulation of great wealth in the mining business, Capt. De Lamar resolved to quit the sea for good and engage in mining. Upon his arrival in Colorado, however, he immediately realized the necessity of a thorough scientific knowledge of geology and mining for the successful prosecution of the business which he purposed to follow, and, thereupon, went to work to make good this deficiency, to the best of his ability, by studying assaying, chemistry, ore dressing, and metallurgy. He spent eight years in mining in Colorado, meeting with very fair success. Among the most important of his undertakings was the development of the Terrible lead mine of Custer County. This property he purchased when it was a mere prospect, for $3500. He opened a large body of low-grade lead carbonate ore, and finally erected dressing works of 250 tons per day capacity for its concentration. This mill, which was at the time the best equipped and by far the largest concentrating works in Colorado, proved very successful. Notwithstanding the low grade of the ore, which averaged in value only about $4.50 per ton, and the high cost of labor and supplies, the Terrible mine was operated at substantial profit, and was sold in 1886 by Captain De Lamar to the Omaha & Grant Smelting and Refining Co. at a good price.

Captain De Lamar spent the next two years in traveling, visiting during this time most of the principal mining camps in the western United States in search of another property to develop. He finally selected a prospect on a mountain, six miles west of Silver City, in Owyhee County, Idaho, where he purchased a group of mining claims for a small amount, and located others around it, so as to cover practically the whole mountain, the property secured representing a tract of mineral land about one mile long and three-fourths of a mile wide. Work was begun by driving a crosscut tunnel into the mountain, to intersect at right angles the veins which cropped at the surface.

The result of the exploration work on this property and its subsequent production proved the wisdom of Captain De Lamar's purchase. A number of parallel veins were cut carrying gold and silver. As these veins were followed on their strike toward the east they were all cut off or pinched out by a dike, at the intersection of which the ore was abnormally rich, carrying into the thousands of ounces of silver per ton.

Captain De Lamar was extremely cautious in his mining operations, venturing extensively, but not without good judgment. The Idaho property was not

equipped with a mill until it had been in his hands for over a year. Then he started with two small, second-hand mills, and not until August, 1890, did he erect a modern 20-stamp mill.

During 1890 many carload shipments were made direct to the smelter which returned $1500 to $2000 per ton, while the mill worked on ore averaging over $30 per ton. This property was sold to an English company in the spring of 1891 for $2,000,000 cash. The Captain subsequently took an interest in the property in lieu of part of the cash, and for a time acted as resident director.

Prior to the sale Captain De Lamar had taken $1,500,000 from the mine. The new company paid its first dividend from the 20-stamp mill in July of 1891. From that date the mine grew steadily, until, with a larger mill, 250 to 300 tons per day was treated. Two entirely new systems of veins were found that added materially to the value of the property, but commercial ore did not extend to great depth in any of the veins, and the quality gradually diminished until about four years ago, when expenses began to exceed returns, and the property closed after an honorable career and a record in which its founder could take just pride.

Captain De Lamar took a very active part in all public affairs in Idaho. In 1891 he was state Senator and was appointed the state's sole representative at the Chicago World's Fair. Being particularly desirous that the state make a good showing at this time, he offered to duplicate from his private resources any sum that citizens of the state might raise.

The De Lamar mine of Nevada, one of the most noted mines acquired and operated by De Lamar, came into his hands in 1893. The original purchase price was $150,000, but it is said that $600,000 was expended before the property became productive. The gross yield reached a total of over $9,000,000 by the end of 1900. The metallurgical history of this property was interesting. There was first established a chlorination plant, which was not entirely successful. A small cyanide plant was next erected, and this grew by successive additions until a daily capacity of 300 tons was reached. A conspicuous feature of the plant was the use of Griffin mills for dry crushing, and zinc dust for precipitating the auriferous cyanide solutions. In 1902 options on this property were given to J. E. and S. Bamberger, of New York, and soon thereafter the property passed into their hands.

Captain De Lamar also was interested in the De Lamar Mine, of Shasta County, Calif., and established the De Lamar Refinery at Chrome, N. J., which was subsequently purchased by the U. S. Smelting Co., in 1905.

In 1900 we note the large holdings of the Captain in De Lamar's Mercur Mines Co., which up to that time had paid about $700,000 in dividends, and during that year was combined with the Mercur G. M. and M. C. to form the Consolidated Mercur Gold Mines Co., a company that has had a long and prosperous career and has been one of the main sources of the De Lamar income.

It was in Mercur that Captain De Lamar came in touch with Colonel Wall, Jackling, and Gemmel, and in 1895 his attention was first drawn to Utah Copper district. His first option on three-fourths of Colonel Wall's property called for the payment of $375,000. For a period of eight years the Captain was more or less interested in this low-grade district, but never became convinced, while the property was undeveloped, that it would be a profitable investment for the very large sum that would be required; so he disposed of his quarter interest in 1903, to those who have made a success of the Utah Copper Company.

Recently Captain De Lamar had been president of the Dome Mines, at Porcupine; vice-president of the Delta Beet Sugar Co.; vice-president of the International Nickel Co.; a director of the American Bank Note Co., Coronet Phosphate Co., Canadian Mining and Exploration Co., and the Manati Sugar Co., as well as having interest in various other organizations.

Since 1890 Captain De Lamar had made his home in the East. He built a town house at 233 Madison Ave., but took the greatest pride in his country estate near Glen Cove, Long Island. Facing the Sound toward the northwest, passers-by on steamers invariably ask whose wonderful place it is. Here he entertained lavishly, exhibiting to his guests his wonderful collections of plants and flowers, and while looking out with them toward the western sunset recalling vividly the interesting incidents of his early life in his adopted country.

Approximately half of Captain De Lamar's estate, having an estimated value of about $20,000,000, goes to Harvard Medical School, Johns Hopkins, and to the College of Physicians and Surgeons of Columbia University "for the study and teaching of the origin of human disease and the prevention thereof . . . and how to secure health by proper diet; . . . and I especially enjoin on the legatees the dissemination of the results of studies, through popular publications, public lectures and other appropriate methods, etc."

The will left by Captain De Lamar bears testimony of the spirit of the man that accumulated the fortune. The welfare of the people of his native land and of his adopted country was an ever-present thought throughout the later years of his life.

Developing a Dutch Salt Deposit

In the annual report of the Dutch Government Research Board for 1911 it was announced that around Buurse, near the German frontier, there were salt deposits at a depth of 350 meters, says *Commerce Reports*. For a time no more notice was taken of it, but the war has taught the Netherlands to develop its own resources and as far as possible to be independent of foreign assistance. In February, 1917, the Minister of Agriculture proposed a bill to develop these deposits, with the object of averting a threatened salt shortage. With some changes, the measure was passed in February, 1918.

Work started in the summer of 1918. After the erection of the necessary boring towers, engine rooms, dwellings and other essential buildings, boring began, and it has already reached a depth of 43½ meters. The boring of the first 7 meters offered no difficulties; from 7 to 80 meters clay strata are looked for, and from 80 to 320 meters it is expected that rock will be encountered. It is thought that rock salt will be found at 320 meters and that the layer will be about 20 meters thick. A deep-well pump will be inserted in the boring, by means of which it is hoped to lift 7 cubic meters (1850 gallons) of brine per hour.

Correspondence and Discussion

Chrome and Manganese Ore Producers

The situation of the producers of chrome ore and manganese ore is not dissimilar. Both have been encouraged to use every effort to find new deposits of ore and increase production from known sources. with the result that, even before November, Washington gave out the information that if foreign ores should be entirely cut off domestic supplies could, in the emergency, meet requirements. We were further informed that it would be inadvisable to open any new deposits. This advice came late, and now, with the war demand tapering off and the future demands for commercial purposes uncertain, producers find themselves in a serious situation, and we are not surprised to learn of the strenuous efforts being made on the Pacific Coast to get the Government to take some action to protect those who have answered the call for more chrome ore and more manganese ore. As demand slackens and shipping facilities increase, shall these industries be permitted to revert to their pre-war dormant condition? Shall thousands of dollars' worth of property and equipment be rendered valueless while hundreds are thrown out of employment?

What form of protection would be best and most practicable we cannot suggest, but the simplest, a high tariff on imports, we fear will not be looked upon with the favor that high tariffs met at the close of the Civil War. There are now fewer than 150 properties producing high-grade manganese ore (35% or higher) with an average output of about 200 tons each per month. We have no figures as to the number of chrome mines working, but we know that the total tonnage is not large and that the number of people interested in the production of chrome and manganese ores is relatively small compared with the number who will have to bear a tax in the event of the adoption of a protective tariff. This is one of the reasons why we doubt the expediency of tariff legislation to protect the situation.

There is another angle from which this question may be viewed. A large number of the new properties have been opened for the purpose of making money out of them. Operators took legitimate mining risks knowing full well that the day peace was declared their product would fall in price.

Though it is deeply to be regretted that a thriving business should suddenly become valueless, we believe that these speculators need no special legislation when the game turns against them. They knew the game; they took their chances, and with peace in sight they should be sufficiently good sports not to complain at the good fortune of the world and their own losses.

Other operators were, no doubt, induced to go into the mining of these metals through patriotic motives, and many of them have not yet recovered their outlay. Such should have our full sympathy, though they probably are not asking it. Having undertaken their work from a patriotic point of view, they will charge up the loss as their bit in the cost of winning the war, and enter no complaint.

If there are only these two classes of operators mining chrome and manganese ores, the speculator and the patriot, no special legislation is needed; and if the speculator is not entitled to special legislation and the patriot does not ask it, none will be forthcoming. The business of mining these ores will gradually assume its normal importance of pre-war days. Chrome and manganese operators will not occupy exactly the same position that they did four years ago, for metallurgical processes have been developing, and the demand for ores will be greater than it was in pre-war time, and there will be some properties favorably situated that will continue to produce and sell at a profit. To this extent the chrome and manganese ore business will have been benefited by the stimulus of war demands. F. F. SHARPLESS.

New York, Nov. 23, 1918.

Cost of Explosives and Production of Gold

To one who is producing gold at a cost of $21 to $22 per oz. the declaration of peace holds out some hope; indeed, it is difficult to understand why the granting of an armistice has not already been felt in some of our supply bills. What the Government can and will do to stimulate the production of a metal which we are given to understand by financiers is greatly needed is something beyond the writer's ken. It would seem that gold was a peace metal rather than a war metal. Certainly the necessity for its production has not disappeared with the cessation of hostilities, and it may be that the demand for it will grow more rapidly than we who are holding on by the ragged edge can now hope for. With the cessation of hostilities we should see a material reduction in our fuel bills, the bills for machinery, tools, steel, and explosives, and in due time, as the cost of food and clothing drops, we will hope to get more tons broken for $10 than are being broken today.

A very large item entering into our mining costs is that of explosives. I think that it would be fair to say that the increased cost of explosives has been much greater than the increased cost of their production, and now that the demand for high explosives has already fallen off, we ought to begin to benefit. If we do not, this is something on which we might call for Federal assistance.

My hope, that it will come naturally in the every-day course of business, is based, to some extent, upon an address by Col. E. G. Buckman, of the Du Pont company, delivered before that company's salesmen on June 19 last.

Colonel Buckman was not dealing directly with mine explosives, which at that time formed but a trifling portion of the output of the Du Pont company, but his

remarks must certainly reflect the general policy of the organization, which could not justify the adoption of a different policy toward blasting powder, so essential to the production of raw material for war purposes and for the production of gold.

I quote a few passages from Colonel Buckman's remarks respecting prices for firearm explosives:

> We have never raised our price to a single one of our regular customers here in the United States. . . . Home military concerns have been charged throughout the period of the war our regular pre-war prices, and have also been given the benefit of every reduction.
>
> Throughout 1914, 1915, and 1916, when the price ranged $1, 90c. and 80c. to foreign governments, we furnished the U. S. Army and Navy all their requirements . . . . of smokeless powder at 50 and 53c. per pound.

Prices quoted show powder selling at $1 per lb. in October, 1914, with gradual reductions, until in April, 1917, it reached 47½c. per pound.

> Invention after invention, economy after economy, was developed for savings which more than kept pace with the rapid increase of raw material and labor.
>
> It was not costing the steel producers 100% more to produce a ton of steel, but the supply and demand enabled them to charge more, and they did it.
>
> Our price on TNT has been reduced from time to time, until now we sell at 35c. per lb., as against $1 in the beginning, which is nearly as low as the pre-war price of 29 cents.

In April, 1917, the Du Pont bid for 115,000,000 lb. of powder for the Government was 47½c. per lb. In 1913 the price had been 53c. for the same grade.

> Du Pont company enjoys the unique position of being the only concern in the United States which is today selling its product at less than pre-war prices. . . . As fast as it could do so, it has of its own volition reduced the prices.

To one who has been paying ever-rising prices for dynamite during the period of the war, these quotations do not make pleasant reading; he feels that the mines must have been singled out as legitimate game. If the Government really needs the gold, and if we are willing to mine it at little or no profit to ourselves, we should certainly not be called upon to pay large profits to those who furnish us with supplies.

We have no desire to see our Government go into the production of powder or the production of any other of our many supplies, but if Uncle Sam needs the gold it is his duty to see that we get our supplies as near cost as possible. The foregoing quotations suggest that we have recently been paying rather handsome profits to somebody. GOLD MINER.

New York, Nov. 25, 1918.

Exchange of Ideas

The ideas held by the late Dr. James Douglas respecting the exchange of information and suggestions, the free discussion of technical practice and the futility of secret practices, have become the ideas of a majority of American engineers, and arguments supporting secrecy receive scant consideration. Feeling as we do on this point, it is questionable if we are carrying out the spirit of the idea and permitting our subordinates to follow a line of which we approve.

Too frequently it is held that the place of the superintendent and foremen is on the job every day in the week and every week in the year, but "all work and no play makes Jack a dull boy," and Jack's education cannot be kept right up to date even by the best technical journals.

It is not the broader question respecting operating that the subordinates will investigate and improve, but the hundred and one little details with which they come in contact every day; not the general system of timbering, but the method of holding a heavy stull in bad ground while it is being wedged into place; not the method of concentration, but the device for getting a minute and constant amount of oil into the maelstrom at a particular point—all of the little details that go to make the success or failure of the general scheme.

If a foreman is worth having, he is one who appreciates a short vacation at company expense far more than an increase of 25c. per day in wages. Loyalty is the watchword of the day. Without it management can scarcely succeed. With it, a desperate case may be brought to life. The encouragement offered by the management in giving its subordinates an opportunity to see what is being done in other mines and works is one of the strongest stimulants to loyalty that may be administered. MINING ENGINEER.

New York, Dec. 2, 1918.

Vanner Belt Cleaner

In the *Journal* of Oct. 19, 1918, there appears a description of a vanner belt cleaner. This is a somewhat elaborate mechanism to accomplish the purpose intended. With a vanner belt properly wet and kept wet as it passes over the head drum, there should be little danger of concentrate adhering to the belt if it is properly submerged in the concentrate box. If trouble is experienced with fine, sticky concentrate, a distributed spray directed normally to the belt ought to be sufficient. I am reminded of a device, once manufactured as an attachment to the Union vanner, which was made at one time by the Union Iron Works, of San Francisco. It consisted of a wooden roller three inches in diameter and so attached to the shaking frame of the vanner as to just touch the belt about midway between the upper and lower head drums of the vanner. It was rotated by the belt. The surface of the roller touching the film of water on the belt caused both water and concentrates to take to the surface of the roller. The concentrates were neatly discharged from the lower surface of the roller. By suspending a narrow trough beneath the roller, the greater proportion of the concentrates were discharged into the trough and carried by a stream of water, which was delivered as a fine jet into the upper end of the trough, to a side discharge. By directing this discharge to a shaking launder, the concentrates from a number of vanners could be discharged to a settling box at one end of the row of machines. The lower portion of the belt dipped below the water in the concentrate box and served to catch the concentrates that escaped the trough. In this way the concentrates that accumulated in the box were small in amount and could be removed at longer intervals than is customary with the usual arrangement of head-box. By attaching the concentrate trough to the frame of the machine so as to reciprocate with the frame, little surplus water was required to keep the concentrates moving toward the discharge end of the trough. I found the device useful on a vanner used for ore testing. G. J. Y.

New York, Oct. 21, 1918.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

The War-Minerals Act

Full realization that the War-Minerals Act is a white elephant has come to officials of the Interior Department, and particularly to those of the U. S. Bureau of Mines. The situation has been studied from all angles, but as yet no announcement of conclusions has been made. It is realized that definite action must be taken soon, that the industries concerned may know just where they stand. It is not improbable that a small amount of the appropriations carried by the War-Minerals Act will be used to compile data and evidence by means of which an accurate report on the war-minerals situation may be laid before Congress, leaving it to that body to determine how the situation is to be met.

The present status of affairs warrants slight hope on the part of the domestic producers of war minerals for relief under the act. In fact, so many difficulties stand in the way of relief, that it is doubtful if means can be devised to bring through without loss those who followed the Government's suggestion to produce war-minerals. One view of the matter, which comes from a disinterested source, may be summed up as follows:

The Government must accept part of the responsibility for this development, although it is not commercially obligated by contracts. The exploration and demonstration of the extent of our chrome resources has, from a national standpoint, been fully justified and worth the capital investment. Though these resources are limited, it has at least been demonstrated that the country has from two to three years' supply of this material on the ground.

If any general policy of reconstruction is to be followed, by which the war activities and industries are to be gradually readjusted with the minimum of loss to producers who have helped to meet an actual necessity, then chromite certainly deserves some protective action for the producers. Since a program had to be formulated for the carrying on of the war, and the country has been saved billions of dollars by its termination, it seems justifiable that expenditures of even millions of dollars should be made in an equitable closing down of the war program.

By Jan. 1, 1919, there will be approximately from 100,000 to 125,000 tons of chromite stocks in the hands of the consumers. This represents a two-year supply on the basis of pre-war consumption. Domestic production is now on the basis of 60,000 tons a year. Canadian production, which is practically all imported to the United States, is at the rate of 18,000 to 20,000 tons a year. Cuban import production is estimated at 15,000 tons. In addition to these sources, there is pressure to import additional quantities from New Caledonia and Brazil, making a total of at least 100,000 tons in sight for the coming year of new production in addition to the stocks already indicated. The situation indicates a large over-supply.

Acid Price Fixing To Cease Dec. 31

At the request of Robert S. Brookings, chairman of the price-fixing committee of the War Industries Board, the committee on acids met in his office in Washington on Dec. 3, according to a statement of the Chemical Alliance. Representatives of the different branches of the Government were present. Mr. Brookings stated clearly that though it was the desire of the War Industries Board to be of every possible assistance to the various industries in which there had been price regulation, it was felt that the need of such supervision and of price fixing no longer existed and that the industry was in position to take care of itself. He also said that it was the desire of the price-fixing committee to permit the fixing of maximum prices on acid to expire with the closing of the present period, namely, Dec. 31, 1918.

After a general discussion it was decided that price fixing with reference to sulphuric and nitric acids be discontinued and that the present prices fixed for the last quarter of 1918 should remain in effect until Dec. 31, 1918, on which date they will automatically expire by time limitation.

The Revenue Bill

Deductions for mine depletion allowed by the new revenue bill are covered in the following paragraph quoted from the text:

In the case of mines, oil and gas wells, other natural deposits, and timber, a reasonable allowance for depletion and for depreciation of improvements, according to the peculiar conditions in each case, based upon cost including cost of development not otherwise deducted: Provided, That in the case of such properties acquired prior to Mar. 1, 1913, the fair market value of the property (or the taxpayer's interest therein) on that date shall be taken in lieu of cost up to that date: Provided further, That in the case of mines, oil and gas wells, discovered by the taxpayer on or after Mar. 1, 1913, and not acquired as the result of purchase of a proven tract or lease, where the fair market value of the property is materially disproportionate to the cost, the depletion allowance shall be based upon the fair market value of the property at the date of the discovery, or within 12 months thereafter; such reasonable allowance in all the above cases to be made under rules and regulations to be prescribed by the Commissioner with the approval of the Secretary. In the case of leases the deductions allowed by this paragraph shall be equitably apportioned between the lessor and lessee. . . . .

Exemption of gold mining from taxation under the bill is provided in the following:

In the case of any corporation engaged in the mining of gold, the portion of the net income derived from the mining of gold shall be exempt from the tax imposed by this title, and the tax on the remaining portion of the net income shall be computed upon the basis of an invested capital which bears the same ratio to the full invested capital as such remaining portion of the net income bears to the entire net income.

Taxation on sales of mining property is covered in the following:

In the case of a bona fide sale of mines, oil or gas wells, or any interest therein, where the principal value of the property has been demonstrated by prospecting or exploration and discovery work done by the taxpayer, the portion of the tax imposed by this title attributable to such sale shall not exceed 20% of the selling price of such property or interest.

Tin, with its alloys and compounds, was removed from the Export Conservation List on November 27.

Although the War Industries Board will cease to exist on Jan. 1, 1918, it is probable that some connection will be maintained between the existing personnel and the Government after that date.

A resolution has been introduced by Senator Jones, of New Mexico, extending the suspension of mining claim assessments to Alaska. In the resolution passed Oct. 5 it was not clear that the suspension should apply to Alaska.

Chronology of Mining, November, 1918

Nov. 1—Wage increase of $1 per day for anthracite miners, authorized by Fuel Administrator Garfield.

Nov. 6—Tin Importers' Association protested to War Industries Board against the fact that U. S. Steel Products Co. should have sole direction of the import of tin.—Shipment of silver bullion to the value of $3,000,000 made from the Government Assay Office at New York to India.

Nov. 11—Armistice signed by Germany.—Licenses for importation of chrome ore, except those covering shipments from Cuba, Canada, and Brazil, revoked by the War Trade Board.

Nov. 13—Monetary system of Mexico placed on a gold basis.

Nov. 15—Agreement reached between copper producers and War Industries Board that provides for maintenance of present production, prices, and wages, and regulation of prices and allocations until Jan. 1, 1919.

Nov. 16—Restrictions on domestic uses of gold and silver for industrial purposes removed by the War Industries Board.—Zinc producers notified to suspend production on the filling of Government contracts.

Nov. 19—Dr. Charles R. Van Hise died.

Nov. 20—Meeting of quicksilver producers with the War Industries Board at Washington to consider prices.

Nov. 22—William G. McAdoo resigned as Secretary of the Treasury.—John D. Ryan resigned as Second Assistant Secretary of War and Director of Air Service.

Nov. 25—New Cornelia Copper Co. paid initial dividend of 25c. per share.

Bituminous Requisitions Canceled

All of its requisitions for the shipment of bituminous coal to industrial plants have been canceled, according to an announcement made on Dec. 5 by the U. S. Fuel Administration. The Administration's policy hereafter will be to leave to the plants themselves the work of obtaining such fuel. It believes, however, that none will have difficulty in getting sufficient supplies.

Mesabi Range Magnetic Iron Ores

The first shipment of 1800 tons of low-phosphorus sinter, produced from magnetic iron ore secured on the eastern Mesabi Range, has been made from Duluth, says *Iron Age*. The ore is to be delivered at the Midvale Steel and Ordnance Co. blast furnaces at Coatesville, Penn., and was produced at the mill at Duluth equipped some time ago by the Jackling interests for the concentration of magnetic ore from the eastern Mesabi Range. D. C. Jackling is the managing director of the enterprise, which is expected to develop to a considerable production of a low-phosphorus sinter from eastern Mesabi ores. The concentrating operations have been carried on in an experimental way for several years, and have been in charge of W. G. Swart. The possibilities of these lean magnetites were brought to the attention of the Jackling-Hayden, Stone & Co. interests several years ago by Dwight E. Woodbridge, who secured the lands now held by the operating syndicate.

The cargo analyses of the shipment just made to Coatesville, Penn., ran 63% iron and 0.008% phosphorus. The cargo thus represents the highest grade ore that has gone from Lake Superior in many years.

The wet magnetic concentrating process is followed at Duluth in a mill which has a capacity of about 100 tons a day. It involves fine grinding for the removal of a large part of the silica and phosphorus, the latter existing as apatite.

Export Restrictions Slackened

Among the commodities removed from the Export Conservation List, effective Dec. 6, 1918, as announced by the War Trade Board, are the following:

Alloys as follows: Cadmium, nickel, titanium, uranium, zirconium. Alpaca metal. Articles containing 10% or more in weight of metallic aluminum. Antimony ore and articles containing antimony. Chromium ore and any metal or ferro-alloy thereof. Cobalt ore and any metal or ferro-alloy thereof. Articles containing 10% or more in weight of copper. Copper pipe, plates, rods, sheets, scrap, tools, tubes, and wire. Crucibles of plumbago or platinum. Industrial diamonds. Ferro-alloys as follows: Ferrocerium, ferrochrome, ferrocobalt, ferromanganese, ferromolybdenum, ferrotitanium, ferrotungsten, ferro-uranium, ferrovanadium, ferrozirconium. German silver and articles containing it. Lead, pipe and sheet. Magnesite. Magnesium. Manganese ore and any metal or ferro-alloy of it. Manganese oxide. Articles containing 10% or more of nickel. Nickel silver. Oil-well drilling apparatus. Ores of radium, strontium, titanium, tungsten, uranium, and zirconium. Plumbago and articles containing it. Pyrites. Scheelite. Silver, manufactured and articles containing it. Spelter. Thorium and articles containing it. Titanium compounds. Vanadium. Brass and copper wire. Tungsten ores. Zinc. Zirconium concentrates.

The board also announced that the following items are still on the Export Conservation List, though under modified classification:

Aluminum ingots. Copper bars and pigs. Lead ingots. Nickel anodes, ingots, and shot.

Licenses for the above are not required to Canada and Newfoundland. Copper ingots and sheet lead are retained upon the list with the original classification.

Iron-Ore Restriction Modified

The War Trade Board announced on Dec. 7 that the restriction previously placed upon the importation of ocean shipments of iron ore, limiting importations to shipments from Cuba and to shipments as ballast from Sweden or Spain, has been modified to permit the issuance of licenses for the importation of calcined spathic iron ore originating in and coming from England, when shipped as back-haul cargo. A previous modification of the restriction upon iron ore was announced in W. T. B. R. 308, issued Nov. 11, 1918.

Employment for Engineers

The attention of engineers and technical men is called to the service of the Division of Engineering, 29 South La Salle St., Chicago, for the purpose of giving them free assistance in securing employment. The division also asks employers of technical men to place orders for additional help for engineering work of all kinds.

For registration blanks write to A. H. Krom, Director of Engineering, 29 South La Salle St., Chicago, Illinois.

A. I. M. E. Meeting at Washington Discusses Reconstruction

RECONSTRUCTION matters, particularly those affecting the mining industry, were discussed by the Washington section of the American Institute of Mining Engineers on Dec. 6. H. Foster Bain acted as toastmaster. The principal papers presented were by C. K. Leith, mineral adviser to the War Industries Board; M. F. Chase, head of the explosives division of the War Industries Board; Edgar Rickard, acting head of the Food Administration, and Chester Narramore, petroleum expert and technologist of the Bureau of Mines.

Officers for the ensuing year were elected as follows: Herbert Hoover, chairman; F. G. Cottrell, vice-chairman; F. L. Ransome, vice-chairman; Paul Merica, Charles Catlett, A. F. Lucas, F. W. Wood, executive committee; A. G. White, secretary.

Professor Leith was of the opinion that any economic scheme of international control concerns principally the exportable surplus and necessary imports, and not the raw materials consumed within the country of origin. It involves essentially the allocation of exportable surplus by mutual agreement, to insure that all are supplied, that no one nation gets too much, that the supply for enemy countries be controlled—that no one nation use more than its share of the world's limited shipping. Any such allocation involves some curbing of the richer and stronger nations. In regard to minerals, the sacrifice of the United States will be relatively greater than that of any other country, for in minerals the country is well able to take care of itself, in unrestricted competition for world trade, because of large and varied resources. One of the consequences of an agreement to control exportable surplus would be the abandonment of the slogan that the United States should make itself entirely independent in regard to all raw materials, even at high cost and with the aid of protective tariffs. From the standpoint of conservation of certain minerals of which domestic supplies are limited, and in the interest of the best use of the world's supplies by all countries, it is not desirable to set up artificial barriers to international reciprocity in regard to minerals.

International Control of Minerals

Professor Leith cited arrangements for international control of certain minerals, already in effect, and indicated the minerals of the United States which would be most affected by a general agreement to control exportable surplus. He concluded that the difficulties involved in controlling international movements of minerals are many and serious, and will weigh heavily on the United States; and that it is doubtful whether this country is ready for this degree of sacrifice of national self-interest for the larger good, but urged the necessity of striving for better international arrangements of some kind for the common use of mineral raw materials. Professor Leith closed with a plea for a more comprehensive study of world mineral statistics and problems by the Department of the Interior and non-official organizations and technical papers.

Mr. Chase stated that at the time the armistice was signed at least 50% of the industries of the country were devoted to war work and at least 30% were doing nothing else. The world's shipping had been reduced and restricted, and the former peace-time trade routes had been disturbed and many of them eliminated. It was believed impossible to revert to commercial lines without serious complications, and, further, the war itself had changed the status of commercial relations to such an extent that at the cessation of hostilities a new era would begin, in which the old established methods of business would have to be completely readjusted to find markets for the products and raw materials for the factories of the United States.

This idea grew largely from the fact that in the European countries there are true reconstruction problems and questions, which during the last two or three years have been studied by commissions or committees. Thus, as early as May, 1916, France was compelled to take up the question of rehabilitating her invaded and devasted territory and of credits to aid in the resumption of agricultural and industrial life. Somewhat later, Great Britain established a Ministry of Reconstruction, which has organized 87 committees and commissions, each studying some particular problem which England, because of her economic dependence on other countries, must solve after the war. In October, 1917, Belgium, faced with the same conditions as France, created a Ministry of Economic Affairs, under which rehabilitation problems are still being investigated and worked out. Italy, too, has established a Ministry of Economic Reorganization. Similar studies have been undertaken, to a greater or less extent, by Canada, Russia, Japan, and other countries, both in Europe and in South America. Germany appointed a commission on economic transition early in August, 1916, and numerous commissions on economics were thereafter formed.

The fact that the commercial and governmental interests of these foreign countries considered reconstruction problems so vital, naturally led the same interests here to think that the United States would also have the same questions, probably differing in degree, to meet and solve.

America Only Partly Converted to War Basis

It is, however, becoming evident that the people of the United States have not the problems that are confronting Europe, and that the country is rapidly going back in many industries to peace-time and commercial production without the disarrangement of business that was thought bound to occur. This in part no doubt is due to the fact that America had only partly converted the industries of the country to a war basis, and that it had been in the war for a much shorter period than its associates abroad. It is also partly due to the fact that American business methods have been such as to lend themselves more readily to quantity production of war material than those of the foreign countries. American industries have proceeded with the production

of war materials along the lines of well-established American business principles, and it has not been necessary, to meet the necessity created by war, to change methods of production, or methods of factory management, radically. Consequently, as the country goes back to the production of commercial articles it has few changes to make in its industrial and political system.

Reconstruction Problems Are Few

When the situation is analyzed it will be seen that actual reconstruction problems are extremely few. They do embrace, of course, the disposition to be made of the railroads, steamship lines, express companies, and telephone, telegraph, and cable lines, all now under Government control. They embrace, also, the disposition to be made of war-risk insurance policies and certain matters of finance and taxation. The question that probably gave the most immediate and deepest concern was that involving the cancellation of contracts for war materials. An unsound policy in this connection might have led to innumerable complications, both financially and industrially, but this matter at the present time has proceeded to such an extent as to warrant the conclusion that complications and troubles which were expected will not come to pass, and that, aside from legislation that may be required to permit of the application of certain sound and equitable principles laid down by the different war purchasing departments, the problems involved in this question will automatically solve themselves. In this particular connection provision has been made by the War Department and other contracting agencies of the Government for a fair and equitable adjustment on all war contracts, and many of the large war contracts are already in the process of liquidation, and the demobilization of war labor is proceeding in an expeditious and orderly manner, without undue hardship either to the labor or to the industries involved. There is little doubt that, as the readjustment proceeds and the industrial and commercial life of the foreign countries is reëstablished, it will be necessary to modify or change former American methods and practices to meet, competitively, the conditions established abroad.

In most part the plans for reconstruction in foreign countries have been based on hypotheses that may or may not be true, and it is inconceivable that plans founded in this way will not require change or have to be abandoned as the true conditions are discovered; and, in attempting to meet these conditions, the wisest plan on the part of the United States will be to keep fully and completely advised as to what is actually happening, so as to be able to act quickly and intelligently to meet each situation as it develops. American institutions are not hampered by traditions and precedents, and American industries have the freedom to act as soon as the people are in possession of the facts.

At the present time the greatest service would be the establishment of such agency as will promptly and accurately give to the country full and complete information on the different situations as they arise, rather than devote time and energy to the solution of problems the existence of which is not certain. The correct statement of any problem goes far toward solving it. America's post-war problems, for the most part, cannot be clearly seen and stated now. They are still in the development stage. It would only be a fortunate guess that would visualize them correctly at this time. To know what they really are, it is essential first to know the terms and conditions of peace.

It is the part of wisdom, therefore, not to be too hasty in proposing reconstruction measures. Only possibilities surround American industry now. It is not possible to build on them. But the future will develop what the realities are. The people of the country should await them with minds that are open, and calm, and ready, confident that, possessed of the spirit of coöperation and sound business judgment and foresight, they will be able to solve the industrial problems of the future as surely as they solved the military problems of the past.

Living Up to Old Traditions

It was never in mining traditions that an effort to raise a fund for a mining regiment such as the 27th Engineers should meet with a meager response. What a scramble there would have been in the old camps and diggings to get in on such a proposition! Read Mark Twain's account of how the money ran like water back in 1861, when the miners of Virginia City were appealed to for wounded soldiers and sailors, and imagine what men like that would have done for a mining regiment all their own. There never was such a regiment before—never such a unique organization representative of the mining industry; and there will never be again—not in our time.

The reckless generosity of the past was perhaps due in part to flush times and easy money, but it still survives in a degree. The more than $19,000 given to the Comfort Fund in the last year bears witness. And it will continue, for though the war is over, there is and will be ample reason for maintaining the fund until the regiment returns and is mustered out. Those who desire to contribute may still do so, with the knowledge that their money is needed and will be well spent.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$18,492.77
C. M. Eye	10.00
C. A. Burdick	5.00
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
Lane Pearl	5.00
W. L. Gibson	5.00
C. M. Fenton	10.00
Charles Le Vasseur, monthly	5.00
B. N. Jackson	10.00
H. A. Johann	10.00
Mrs. A. B. Emery, Messina, Transvaal	10.50
A. C. Stoddard	5.00
Robert E. Tally	25.00
Nelson P. Hulst	20.00
Lawrence Addicks	20.00
R. R. Boyd	25.00
E. R. Varela	5.00
W. J. Olcott	25.00
J. E. Clennell	10.00
C. M. Eye (monthly)	10.00
A. H. Hoffman	10.00
Francis Drake	25.00
Employees of Sociedad Minera Backus y Johnston del Perú	176.29
Charles Le Vasseur, monthly	5.00
F. Wartenweiler	10.00
Walter Douglas	100.00
Robert E. Dye	10.00
Total	$19,179.56

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Owing to the large volume of work involved in administering the fund, contributions are acknowledged only by publication in the *Journal*.

Reciprocity on the Part of Labor Needed To Solve Industrial Problem*

By J. PARKE CHANNING

THE settlement of the so-called labor problems will depend, in great measure, on the way they are handled; and it is unfortunate that publicity has recently been given to certain ill-advised remarks, made by those who were unaware of the full circumstances, that wages must necessarily be reduced, hours lengthened, and other similar steps taken in the near future.

There is nothing to justify predictions of such a character. No apparent reason is evident why wages should be reduced, provided coöperation on commonsense lines could be achieved, and a mutual respect established between the two groups. Disregarding the actions of a handful of malcontents, it may be said, without fear of contradiction, that labor has stuck loyally to its post through the recent international crisis; and for this alone labor deserves consideration and fair treatment.

Progress has been made in the reorganization of social relations and conditions among the wage earners, and the war has led to drastic changes in England. Ten years ago an engineer of international repute came to the conclusion, after a careful study of the situation, that 10% of the entire population of Great Britain were positively underfed, 10% were only able to say that what they received enabled them to keep body and soul together, 25% were earning satisfactory wages, and 10% lived in comparative affluence. Such a state of affairs could only be described as a sorry reflection on the attitude of all concerned, and, in itself, was sufficient to condemn the whole structure under which such a system could exist.

The war has changed the conditions of the working classes in England to a material extent, and a return to pre-war conditions is inconceivable. Although many reforms have been instituted as temporary measures, and were adopted to encourage production and to meet the exigencies of situations that arose in war time, it is now being realized that there was something fundamentally wrong with British sociological conditions before the war; and that to abolish those measures which have contributed so much to the contentment and decency of the population, merely because the war was over, would be the height of stupidity.

In the United States no similar condition has ever existed. It has been, however, only in comparatively recent times that employers have realized that conditions were not as satisfactory as they ought to have been, but there has been no delay in setting things to rights. Social matters have been vastly improved in many centers of industry; and responsible corporations have made exceptional efforts to foster a spirit of contentment, based on equitable dealing, which has done much to cement the feelings of coöperation that are now in evidence. Unobtrusive efforts have been made in many instances to assist men in owning their own homes, without raising the suspicion that any paternalistic action was being taken. Minor disabilities such as were found to arise in those cases where men refrained from interesting themselves in home ownership, because their industry happened to be operated in an isolated district, have been removed; and the personal aspect of the matter has been studied to a logical conclusion. The results have been wholly satisfactory. Unhygienic and unsanitary features have been removed; and, in the majority of cases, employers, especially those operating on a large scale, can say that everything possible has been done. Good wages are being paid, and the hours of labor have been materially reduced; general educational and living conditions have been greatly improved; and salutary efforts to promote closer contact and coöperation between employers and employees are already bearing fruit.

On the question of a minimum wage and maximum hours of labor, there is much to be said in favor of both. Men must have sufficient to be able to live up to the American standard of decency and comfort, without which it is impossible to engender the proper spirit of self-respect. A fair wage must, of necessity, be an equitable wage, and, although opinions may differ, there is ample evidence to show that profit sharing is impracticable in the majority of instances. To illustrate this one might take the case of two mines, adjoining one another, where dividends amounting to 5 and 50%, respectively, are being paid annually. If a workman does a fair day's labor in the high-grade mine he would, according to this system, receive a proportionately large bonus. His colleague in the low-grade mine, working just as loyally and just as industriously, would receive practically no bonus. The allocation would therefore be made on an inequitable basis, it would lead to as much dissatisfaction as satisfaction, and the system would ultimately defeat its own ends.

With regard to maximum working hours, there was a gradual accumulation of opinion that the eight-hour day was the logical sequence of a general betterment of conditions. Not only would it give the employees a fuller opportunity to enjoy the benefits they can obtain from the higher wage they can earn, but the general adoption of the eight-hour day must inevitably lead to an appreciable increase in the efficiency of operations. Experiments have been made in connection with which a logical excuse might be proferred for the extension of working hours above the limit mentioned, but results have been invariably of a nature to confirm the conviction that there is nothing to be gained by an adherence to the older system.

The maintenance of high war-time wages, maximum working hours, and the vast expenditures involved in modern welfare work are real concessions of incalculable value to the employees. There is one fundamental requirement which is essential to success in an undertaking where the various units are so interdependent

*Abstracted from an address delivered at the Reconstruction Conference, Atlantic City, N. J., on Dec. 4.

as employers and employees are to one another in industrial work. *There must be reciprocity.* The men must respond; and if they mean to support their side of the bargain they must be prepared to show an unfailing high efficiency in their work. It is only under these conditions that the continuance of high war-time wages is feasible—it is the secret of future success—it is the keystone on which will rest America's greatness in industry, and the contentment of her people.

To achieve the complemental attitude of employer and employee, more attention must be paid to the study and application of human engineering—more time must be spent in the sympathetic perception of the personal aspect of the matter, as viewed from the worker's standpoint. A frequent fault among employers is their inability to realize that their workers are not always keen witted, and that infinite patience and unremitting perseverance are needed before what may be termed the obvious logic of a change in economic conditions, really to the benefit of both parties, can be understood and viewed as desirable.

Large corporations are often unwieldy, and the personal contact between employer and employee is a thing of the past. This being the case, it is imperatively necessary to see that foremen and others who have the direct handling of men should be educated to appreciate the other man's personal and often biased point of view. Those in immediate control should be ready to coöperate and help, rather than to order; and to restrain their authority for those rare occasions when it is really needed. The study of human engineering will have an important effect on the future relations between employer and employee, especially in such times as the present, when calm reasoning is an essential to ultimate success.

November Pig-Iron Production

Pig-iron production during November was 3,354,074 gross tons, or an average of 111,802 tons a day, according to *Iron Age*. This is a net loss of 860 tons a day, compared with October production, and is due to a considerable extent to banking and blowing out stacks on account of coal shortage. On Dec. 1, 360 furnaces were in blast, as against 366 on Nov. 1, five having been blown in and 11 blown out during the month. The estimated daily capacity in blast Dec. 1 is 111,330 gross tons, as compared with 113,500 tons estimated Nov. 1. The production of ferro-alloys amounted to 59,638 gross tons for November, of which 33,545 tons was ferromanganese and 26,093 tons spiegeleisen.

Australian Copper Contracts

SYDNEY CORRESPONDENCE

The last contract made with the Imperial Munitions Department was planned to expire on Dec. 31, 1918. As the contract is only for transactions in refined copper, the blister produced in November and December will not come upon the market as refined copper until January and February, 1919. There being no news to date of an extension of the copper contract into 1919, the federal government announces that it will finance copper companies for the first three months of 1919. The method of accommodation will be, no doubt, by advances against the refined copper as produced. On present outputs this means advancing on about two months' production, which is about 6500 tons. Considerable benefit will result to the copper producers, who already have had to make heavy financial arrangements for themselves during 1918.

Foreign Trade in Metals and Ores

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for October, 1918, and the figures for October, 1917, as finally revised, are as follows:

IMPORTS, OCTOBER, 1917, AND 1918

(In pounds, unless otherwise stated)

Metal and Ore	Oct., 1917	Oct., 1918
Antimony ore, contents	227,329	36,271
Antimony matte, regulus or metal	3,518,968	3,025,609
Copper:		
Ore, contents	10,854,432	2,908,757
Concentrates, contents	3,351,840	4,046,730
Matte, regulus, etc., contents	125,659	3,156,878
Imported from (in part):		
Canada	2,543,466	917,162
Mexico	3,082,950	5,742,618
Cuba	2,140,190	1,959,063
Chile	5,124,818	713,349
Peru	1,277,726	1,655
Venezuela	162,781	352,736
Unrefined, black, blister, etc	23,089,950	33,884,114
Refined, in bars, plates, etc	20,127	2,080,763
Old, etc., for remanufacture	1,583,587	43,863
Composition metal, copper chief value	31,002	.....
Lead:		
Ore, contents	2,049,030	2,247,675
Bullion, contents	2,722,284	11,252,412
Imported from (in part):		
Canada	64,929	1,654,000
Mexico	3,941,213	11,846,083
Pigs, bars and old	1,087,179	9,812
Pyrites, long tons	94,119	35,051
Imported from:		
Spain, long tons	68,764	.....
Canada, long tons	25,355	35,051
Zinc:		
Ore, contents	7,614,633	4,104,712
Imported from:		
Canada	1,333,925	190,000
Mexico	4,702,033	3,914,712
Australia	1,578,675	.....
Blocks or pigs, and old	15,447	.....
Manganese ore, long tons	60,649	48,917
Imported from (in part):		
Cuba, long tons	2,498	6,171
Brazil, long tons	54,685	37,885
British India, long tons	1,700	.....
Tungsten ore, long tons	431	956

EXPORTS OF COPPER, LEAD AND ZINC

(In pounds)

	Oct., 1917	Oct., 1918
Copper:		
Ore, contents	435,700	364,000
Concentrates, contents	137,541	15,400
Unrefined, black, blister, etc	4,256,707	110,066
Refined, in ingots, bars, etc	81,316,000	31,088,599
Exported to (in part):		
France	38,807,313	7,906,150
Italy	15,267,052	7,404,974
Russia	9,795,720	.....
United Kingdom	13,393,535	7,579,083
Canada	2,902,126	5,561,528
Composition metal, copper chief value	8,951	5,447
Old and scrap	60,542	332
Pipes and tubes	522,975	257,291
Plates and sheets	9,942,509	301,029
Wire, except insulated	2,008,119	2,439,991
Lead:		
Pigs, bars, etc., produced from domestic ore	5,329,000	3,687,147
Pigs, bars, etc., produced from foreign ore	21,039,360	3,551,419
Exported to (in part):		
Denmark	111,923	.....
Canada	44,028	199,034
United Kingdom	7,009,740	4,182,248
Argentina	1,388,197	.....
Japan	.....	2,464,000
France	1,733,916	.....
Brazil	1,367,739	336,103
Zinc:		
Dross	2,450,885	2,373,237
Spelter:		
Produced from domestic ore	10,202,224	12,888,244
Produced from foreign ore	4,901,762	2,927,366
Exported to (in part):		
France	7,112,722	672,000
Italy	2,850,014	158,053
United Kingdom	3,278,121	13,069,286
Canada	1,814,784	1,008,384
Mexico	110	2,113
Japan	.....	628,098
Australia	.....	224,000
In sheets, strips, etc	1,912,448	4,268,029

Editorials

The Situation in the Metals

AS PRODUCERS get their bearings through partial lifting of the fog that enshrouded them upon the sudden advent of the armistice they begin to get views that are not very cheerful.

The copper producers find themselves with about 800,000,000 lb. of crude copper on hand and in transit, which was very costly to produce. Although there is no great stock of refined copper, it is now beginning to accumulate. Australia and Japan also have stocks of copper. Great Britain does not apparently need to buy any copper right away. Germany can't.

Lead manufacturers are experiencing unexpected cancellations, and lead is backing up on them and is also accumulating on the hands of the producers. The reduction by the latter of the price to 7.05c. did not stimulate any buying worth mentioning. The lead producers are facing the facts better than anyone else and are curtailing their outputs. The Mexican output is also being curtailed. The disposition of that supply, which must go abroad, is a matter of concern, as also is the rise of the London price to £40, on which basis some of the Mexican ore is bought.

Zinc, having had a free market, is less disturbed than copper or lead, but the situation with respect to high-grade metal, which is increasing in supply, affords food for thought. Great Britain seems to be well supplied with zinc, but France probably has need of some for immediate requirements, and it is the hope of selling to her that has in part bolstered up our market for common spelter. However, we cannot be sure that France will buy all her spelter from us and not any from Japan. Of one thing we can be sure, and that is that Australian ore is going to be delivered to Europe for smelting just as soon as shipments and smelting arrangements can be managed.

In the Joplin district the mining of zinc ore has become pretty unprofitable, and production is largely curtailed. The sliding scale arrangement between miners and smelters, with allocation of sales among the ore producers, has been abandoned as a fiasco. It could hardly have resulted otherwise. Western ore producers find it difficult to sell their ore, for smelters, already well stocked, do not like to load up with more.

In iron and steel the business seems to be in such things as nails, fencing, etc., that people must have anyhow. There is no buying for new construction, and the railroads are not buying. Judge Gary talks of reductions in prices.

Ores—manganese, tungsten, chrome, pyrites, etc.—are unsalable. Everybody is overstocked.

Silver maintains its price, and platinum, as we forecast, even has risen, but both these precious metals possess especially favorable conditions. In the base-metal markets readjustment downward is inevitable and is to be welcomed, for there will not be any large buying at present prices. The longer the day is put off that will lead to the entire elimination of interference and to restoration of free markets, the longer and more troublesome will be the period of readjustment. And by the elimination of interference we do not mean only Government interference, but also the inpediments by producers, who by joint actions, curtailments for exaction of arbitrary prices, and other uneconomic measures seek to continue artificial and unhealthful conditions.

Among the major metals, the situation in copper is the most awkward. It is being aggravated by the mischievous agreement with the War Industries Board *to maintain production* and the unholy sanctioning of an agreement among the producers to maintain an asking price which they cannot get and which none of them thinks he can get. This has temporarily abolished a market and is producing a mounting financial burden. The sooner the producers dissolve their agreements and let a natural market create itself, the better will proceed the inevitable readjustment in their industry.

Reconstruction Labor Problems

WIDE publicity has been given to and considerable interest has been aroused in the address of John D. Rockefeller, Jr., which was delivered at the recent Reconstruction Conference at Atlantic City. Those who had the privilege of hearing him were unanimous in their recognition of the sincerity of his attitude and the deep significance of his words. There could be little opposition to his contention that the primary purpose of industry is to advance social wellbeing rather than to afford a means for the accumulation of individual wealth. With this idea in view Mr. Rockefeller has formulated what has been termed a "labor creed" to which he proposes that industry should subscribe. Its principles met with general approval at the conference, and it was adopted unanimously as a resolution at the closing session.

Mr. Rockefeller spoke almost entirely in the interest of labor. His creed, if accepted, will insure the continuance of those concessions which have been made by capital during recent years; it will help toward the establishment of that new era of peace and prosperity that we will all welcome. Taken by itself, however, no subscription to the lofty idealism of Mr. Rockefeller will necessarily insure success. For this can come only by coöperation, and coöperation from reciprocity of consideration. Concessions must be mutual, and self-interest must be waived. History has shown that although, as Mr. Rockefeller says, the application of right principles never fails to effect right relations, there have been times when a literal interpretation of the attitude of passivity enjoined in the Sermon on the Mount, in the face of repeated imposition, has led

to the reverse of an amicable settlement of the difficulty.

An abstract from J. Parke Channing's address, which was made at the same conference, when he spoke to the group embracing engineering and other industrial professions, is given in this issue, and is a fitting supplement to Mr. Rockefeller's pronouncement. It is appropriate that attention should be drawn to the fundamental requirement of reciprocal consideration on the part of labor. If capital is prepared to go the length that Mr. Rockefeller proposes to insure the happiness, comfort, and contentment of the great majority, then labor must be prepared to maintain that state of efficiency and loyalty without which there is little possibility of coöperative success. It is only on such conditions that a high standard of wages can be considered practicable.

Beware the Metric Propaganda

A NEW and dangerous attempt to make the metric system compulsory in the United States is now being launched. It has been made an Administration measure. A bill has already been introduced in Congress. There is talk of working it into the clauses of the peace treaty or in the program for a league of nations. The arguments are the same old fallacies, which survive repeated exposures. It is impudently reiterated that a majority of the nations of the world use the metric system, which is true, and the majority will be even larger if the new nations of middle Europe be counted. But the minority includes the greatest industrial nations—America and Great Britain and her colonies—and the majority of the industrial people of the world do not use the metric system. If uniformity is what is wanted, the metricists would better work for the universal adoption of the English system.

Then there is the old phantom theory about South American trade, although Mr. Halsey showed in a conclusive paper presented to the American Society of Mechanical Engineers last week, that the export trade with South America is mainly done by the English system, and that the South American countries, after many decades of trial, have not even been able to adopt the metric system more than partially in their own internal business.

If this thing comes up in Paris are we going to have to depend upon Great Britain to safeguard the welfare of American industry? Fortunately the adoption of the metric system by Great Britain was exhaustively considered by a British government commission, which this year reported adversely. On the other hand, Lenine and Trotzky recently decreed the compulsory adoption of the metric system in Russia on Jan. 1, 1919!

The *Journal* used to be in favor of the metric system, and for certain special purposes—international statistics, for example—still uses it. But study of it and experience with it convinced us that any attempt to force it upon the United States would be calamitous. The metric system has been for a long time *legal* in the United States, and those who for any reason find it advantageous are free to use it and do so. But its *compulsory* adoption would bring industry to a standstill and would even hamper thought. Experience in every foreign country, however, has shown that *compulsory* national adoption is impossible, wherefore the result is confusion, which in the cases of Great Britain and the United States would be calamitously costly. It is our mature judgment that a Congressional enactment that on and after a certain date no business in this country would be legal unless it were transacted in the French language would be less harmful than the compulsory transaction of business by the metric system of weights and measures.

It may be asked why that was not so in Germany when she adopted the metric system. Simply for the reason that her adoption of it happened before she had any great industrial development and her infant industries could relatively easily be taught to think in terms of the new units, and use them; just as children are easily, notoriously easily, taught to speak a foreign language. The forcing of the metric system upon Great Britain and the United States would now be playing into the hands of Germany. Lenine and Trotzky, proved German agents, do that in Russia as part of the program.

Helping Russia

THREE vessels laden with commodities have already been sent by the War Trade Board to Siberia for the new United States Russian Bureau, incorporated, which was organized at the direction of the President for the purpose of helping the Russians to help themselves in stabilizing the economic situation in that country. More vessels will be sent, and the board asks that persons interested in shipments and Russian trade address the Russian Bureau for detailed information. The company will engage in the business of exporting to Russia and Siberia agricultural implements, shoes, clothing, and other commodities which the Russian population need, bringing back Russian and Siberian raw materials in return. The Russian Bureau has a capital stock of $5,000,000, all of which has been issued and fully paid in cash out of Government bonds. The stock of the Russian Bureau is owned in its entirety by the United States Government.

We are glad that this excellent start has been made in a very important matter. Let us suggest that our Government ship promptly to Russia a large part of the immense surplus stocks of clothing and other material that our War Department has on hand. We do not need them. The Russians do.

Freedom of the Seas

WE HAVE heard for several years, especially since the Germans started the war, the expression "Freedom of the Seas." We are hearing a good deal about it now.

We have assiduously endeavored to ascertain the meaning of that expression. We have inquired vainly of many persons. Nobody could, or would, explain.

Before the war, ships of any flag used to sail the seas, wherever they would, without hindrance. We thought therefore that the seas were free. We could not understand Germany's complaint. We cannot understand present references to this abstraction.

BY THE WAY

Birmingham, England, is the center of a number of manufacturing industries, many of which are metallurgical or have to do with metals. The close association of the people with these industries is reflected by the use of such street names as Brasshouse Lane, Foundry Lane, Muntz Street, Steelhouse Lane, Irons Lane, and many others of like character.

"Now that the war is over, it is time to talk mining," writes a mineral expert. "Don't forget that I am versed in mineral deposits both in the U. S. A., Central America, and Mexico, and am the pet of the prospector, so that I am next to stuff that Big Money can't even buy. All I ask is a decent chance." The way these dollar-a-year men are getting back into private life is certain proof that the war *is* over.

The current Russian budget, some details of which have been published in London, reveals an estimated expenditure on the public services, including posts and telegraphs, of 916,000,000 rubles ($458,000,000), and the receipts from these services are placed at 357,000,000 rubles, or $178,500,000. The Putiloff locomotive works absorbed 92,000,000 rubles ($46,000,000), turning out only five locomotives.

While the Stock Exchange stagnates, a really tremendous boom is in progress elsewhere, says the writer of "Wall Street Paragraphs" in the *Evening Post*. Out on the curb, the "penny mining stocks" have come into their own, with advances in price of thousands per cent. The "big board" never had anything to compare with such movements. It is the turn of the gold-mining shares. One which a fortnight ago was selling for 3c. a share is now up to 36 or thereabouts; others have gone from 2 to 30. These booms are accompanied by talk of striking pay dirt on one or two of the properties, the curb having no need of the finespun economic theory that, with the presumptive approaching increase in the purchasing power of gold, gold mines should be more valuable to their owners. One of the most impressive things about the movement is the fact that the outside market bothers itself so little about bankers' restrictions on loans for speculation.

Away back in the early years of the twentieth century, there entered a barber shop in Globe, Ariz., an individual whose general get-up resembled that of Abe Lincoln on one of his absent-minded days. With a preoccupied air, he passed his large hand over sturdy but camouflaged jaws, thus conveying to the mind of the tonsorial artist the hint that he desired a shave and did not wish to be annoyed by any gossip and chatter, which would tend to interrupt his meditations. Scarcely had the lather been applied, however, when the professor began his customary clatter. "Stranger in town, ain't ye?" The victim stirred slightly, grunting "Uh-huh," in a manner intended to hang up the receiver, as it were. "Got a job at the O. D. smelter?" A similar response was forthcoming, accompanied by a feigning of drowsiness and a readjustment of the long limbs in a more comfortable position. The affirmative responses became fainter and fainter, to the queries of "Good pay?" "Do you like the company?" "Has the new big boss arrived yet?" etc., until a change of tactics to "Do you work on the charging floor, tapping floor, or around the stockpile?" brought results in the form of a drawling "Oh, I kind of look around here and there and hang around the office some." A look of compassion spread over the barber's countenance as he said, as gently as he could, "Oh, I see. You're the new watchman. There ain't much pay in that, but if you're steady there's chances. Say, bo, I got a lot of influence with some of the foremen, and maybe I can help you. Now what might your name be?" This roused the sleeper from his lethargy. Stretching a bit, he responded: "Me? Oh, my name is Ricketts."

Cap'n Dick was interested in watching the mine surveyor as he and his assistant were measuring up the underground contracts. A few quick movements, a few notations in the notebook, and the men were off to the next stope. "M'son," says Cap'n Dick, "w'en thee comes to think on un, this 'ere edication is a gert thing. Never naws to w'ere she'll lead, an tha moor thee gets, tha moor thee wants. Naow, dam-me, w'en I firs' wuz minin', we 'ad none o' these 'ere fancy tape-lines, an' I tell 'e, man wuz lucky if 'e 'ad bit o' compass to tell w'ere 'e wuz gawin. O' coorse, 'e nawed 'ow 'e wuz gawin, but, m'son, 'e never could tell the 'ow 'e nawed. Mus' 'a bin this 'ere h'intuition, I guess. As to this 'ere measurin', I mus' h'admit some 'ead work wuz needed. For h'instance—Tom Broad an self are 'ere workin' in this bloody stope, with Tom up on 'igh. Tom shouts daown to me, ''Ere, Richard, gos along do! Get Jan Kevern an 'and us up bit of a bloody stull, will 'e?' ''Ow long dost thee want this 'ere bloody stull, Thomas?' shouts I. 'A h'axe 'andle, a 'ammer 'andle an a gert flat rock,' sez 'e. So figger un h'out, son; 'ow much is un?

All hearts respond to the following poem, which was found written on a powder box used for a cupboard in an old prospector's cabin near Neihart, Montana:

About six miles from Neihart, that city of great strife,
There was a silver-lead mine, rich and free,
Where an honest-hearted miner
Ust to lead a happy life,
Contented at his work as he could be.
He walked the earth quite proudly,
A Bonanzie King for sure,
And he thot know disappointment could befall;
But he left his work one evening,
His sad heart knew the truth,
For the pay streak had gone off into the wall.

There is a name that is never spoken,
There is a miner's heart that's broken,
For he thot he'd be invited to the inauguration ball,
And there is still a memory living
Of how prospects are deceiving,
When the pay streak wanders off into the wall.

Now he sits without his cabin
Thinking of the coming years, and
Wondering what the future has in store.
The demon of despondence is wailing in his ear,
And the hungry wolf is howling at his door.
Still his heart is in the mountains
There among the rocky seams, and he sometimes
Thinks it's gone beyond recall.
'Neath the Spangles in the rosie relm of dreams,
Lyes the pay streak that went off into the wall.

The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for the foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons if so requested.

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10112—TAILING EXCAVATOR at the Plant of the New Cornelia Copper Co., Ajo, Ariz. (Bull. 143, A. I. M. E., Nov., 1918; 2¼ pp.) Discussion of paper of Frank Moeller.

GOLD AND SILVER—CYANIDING

10113—PRECIPITATION—The Application of Charcoal to the Precipitation of Gold from Its Solution in Cyanide. H. R. Edmands. (Bull. 168, I. M. M., Sept. 26, 1918; 2 pp.) Further contributed remarks on article previously indexed.

10114—PRECIPITATION—The Effect of Oxygen upon the Precipitation of Metals from Cyanide Solutions. (Bull. 143, A. I. M. E., Nov., 1918; 1 p.) Discussion of paper of T. B. Crowe.

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(See Also "Petroleum and Natural Gas")

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10228—LABOR—Housing of Labor and Sanitation at Mines in India. J. H. Evans. (Trans. Min. and Geol. Inst. of India, Apr., 1918; 10 pp.)

10229—LABOR—How to Determine Cost of Living in an Industrial Community. Ray M. Hudson. (Industrial Management, Sept., 1918; 8 pp.)

10230—LABOR—The Human Element in the Mill. (Chem. and Met. Eng., Aug. 11, 1918; 4½ pp., illus.) Address by Hugh K. Moore at meeting of Am. Inst. of Chem. Engs.

10231—LABOR—The Life of a Mining Community. Chas. F. Willis. (Eng. and Min. Journ., Oct. 26, 1918; 2½ pp.) 20c.

10232—LABOR—What About Labor? Editorial. (Eng. and Min. Journ., Nov. 23, 1918; 1 p.) 20c.

10233—LABOR CAMP of the Minnesota Steel Co. (Eng. and Min. Journ., Nov. 23, 1918; ¾ p., illus.) 20c. Excerpt from Monthly Review of U. S. Bureau of Labor Statistics, April, 1918.

10234—NATIONAL SAFETY COUNCIL, The. (Eng. and Min. Journ., Sept. 14, 1918; 2 pp., illus.) 20c.

Personals

Have You Contributed to the Association of the 27th Engineers?

G. L. Sheldon, of Ely, Nev., is doing professional work in Boulder County, Colorado.

Dr. L. D. Ricketts, consulting mining engineer, will spend the winter at Chandler, Arizona.

Horace V. Winchell has been nominated for president of the American Institute of Mining Engineers.

O. R. Whitaker, mining engineer, of Denver, Colo., has recently returned from a professional trip to Northern Mexico.

Harry J. Wolf, of the Malm-Wolf Co., examined the Eagle silver-manganese mine near Bonanza, Colo., during the latter part of November.

J. Parke-Channing was chairman of the "Industrial Professions" group meeting at the Reconstruction Conference at Atlantic City on Dec. 4.

Louis W. Adams has been appointed manager of the new openhearth and mill department of the Ashland Iron and Mining Co., Ashland, Kentucky.

Arthur J. Hoskin, consulting engineer of Denver, Colo., has returned after a three-months' stay in Dillon, Mont., where he was engaged in installing an oil-shale plant.

F. B. Hyder, until recently with the Thane Exploration Co., with offices in San Francisco, has accepted an appointment as mining engineer with the U. S. Bureau of Mines.

A. W. Allen attended the Reconstruction Conference of the Chamber of Commerce at Atlantic City, Dec. 3 to 6, and acted as secretary at the "Non-Ferrous Metals" (major) group meeting.

William W. Lewis has resigned as superintendent of the Western Reserve works of the Brier Hill Steel Co. at Warren, Ohio. **Abner Hughes,** formerly assistant superintendent, is his successor.

Milnor Roberts, of the University of Washington, will deliver an address on "The Stimulus to Research Given by the War," at the Sigma Xi meeting to be held on June 4, 1919, at the university.

Verne W. Aubel, who recently returned from blast furnace work in Australia and New Zealand, has been appointed assistant superintendent of blast furnaces at the Clairton, Penn. plant of the Carnegie Steel Company.

H. S. Mudd, who has been connected with the U. S. Bureau of Mines work on war minerals since September, 1917, will return to the management of his own mining properties on Dec. 15. His headquarters will be in Los Angeles.

Julius S. Bache was elected president of the Dome Mines Co., Ltd., at a meeting of directors of the company, succeeding the late Capt. J. R. De Lamar. **Alfred H. Curtis** was elected treasurer and **S. Wexler** assistant treasurer.

Lieutenant-Colonel Ralph Stokes, who used to be mining engineer with the International Nickel Co. and has many friends here, is now in command of the engineers with the British Expeditionary Forces in northern Russia.

Harry E. Higgins has resigned as director and vice president of the Otis Steel Co., Cleveland, Ohio. He has been connected with the company for several years, and previously held the position of general manager of the Cleveland Steel Co., Cleveland.

Henri Jequier, chief metallurgist of the Société Minière et Metallurgique de Penarroya, which operates the chief lead mines and smelting works of Spain, sailed for home on the "Espagne" Dec. 5. Mr. Jequier spent about nine months in this country studying American metallurgical practice.

E. Gybbon Spilsbury was appointed to represent the American Institute of Mining Engineers at the Engineering Congress in Paris. The delegation from the United States, invited by the French government, is composed of members of the four large engineering societies. The delegation sailed on the "Rochambeau" Dec. 5, and expects to be away about six weeks.

Pope Yeatman, head of the non-ferrous metals section of the War Industries Board, having completed his conferences with English and French officials, sailed for the United States on Dec. 7. Mr. Yeatman has made no report, but has advised his office that he had an interesting trip over the battlefields, including an inspection of the iron and coal region about Lille. He also mentions a very pleasant visit with Capt. Edward S. Berry, of the 27th Engineers. Through him, Mr. Yeatman learned of the very creditable work being done by the 27th Engineers, although he himself was unable to visit the mining regiment's headquarters.

T. E. Mitchell, formerly resident manager and attorney for the Burma Mines, Ltd., Namtu, Northern Shan States, Burma, registered at the office of the American Institute of Mining Engineers during the last week. Others who registered there were: E. W. Westervelt, superintendent of the Hobson Silver-Lead Co., Ymir, B. C., Canada; Timothy D. Walsh, mining engineer, Nevada Arizona Mines Co., Hackberry, Ariz.; C. S. Corbett, geologist for the E. J. Longyear Co., Minneapolis, Minn.; Rudolph Emmel, mining engineer, of Marysville, Mont.; Lieut. Allen G. Waite, Signal Reserve Corps, Aviation Section; Joseph E. Pogue, U. S. National Museum, Washington, D. C.; Henry L. Slosson, mining engineer, of San Francisco, Calif., and A. McLintock, surveyor and engineer, of Harmon, New York.

Herbert C. Hoover was the guest of honor at a reception in the Hotel de Ville, at Brussels, on Dec. 6. Burgomaster Max, in a speech welcoming Mr. Hoover to Brussels, of which city he was recently elected a citizen, said: "In greeting the friend of the Belgian nation I am interpreting the feelings of 8,000,000 human beings saved from famine, exhaustion, and death. When the torments were let loose on Belgium, our eyes turned to the United States. We knew that that great people would not allow justice to succumb nor permit civilization and the future of humanity to become the playthings of a preying race. Our country was twice saved by yours, for the intervention of the American armies which decided the result of the war and delivered our territory, would have freed nothing but a vast cemetery if it had not been preceded by the magnificent work to which the name of Hoover will forever be attached."

Obituary

Stephen L. Allyn, consulting engineer, of Arizona, at one time with the United Verde Extension Mining Co., of Arizona, died recently in Los Angeles, aged 60 years.

Hugo Hogberg, master mechanic at the Temiskaming mine, Cobalt, Ont., died on Dec. 1 from pneumonia, aged 37 years. He was born in Sweden and for the last five years had been in the service of the Temiskaming Mining Company.

Alfred Ernst, consulting engineer for steel companies in the Pittsburgh district, died on Nov. 27 at his home in that city, aged 57 years. He was a graduate of the Vienna Technical Institute, Vienna, Austria. At the time of his death Mr. Ernst was on the consulting staff of engineers of the U. S. Bureau of Mines, and one of the leading authorities in the country on technical phases of steel manufacture.

Charles P. Brooks, mining engineer of Salt Lake City, died Nov. 30 of heart disease, aged 67 years. In 1874 he settled in Salt Lake City, where he went into partnership with R. H. Browne. He later became a member of the Salt Lake City Board of Health; surveyor of Salt Lake County; consulting engineer for the Board of Public Works in the construction of the sewer system of Salt Lake; member of the Board of Public Works; and a United States deputy mineral surveyor for Utah, Idaho, Nevada, and California.

Dr. Harry P. Corliss, chemical and metallurgical engineer, died on Nov. 16, at Ray, Ariz., from pneumonia following influenza. He was 32 years old. Upon graduation from New Hampshire State College, in 1910, he received a fellowship in the Mellon Institute of Industrial Research at Pittsburgh, which he held for five years. His work during this period resulted in several improvements upon the flotation process, including the discovery of alpha-naphthylamine as a flotation agent. In 1917, he went with the Metals Recovery Co. to make larger application of his discoveries.

Societies

American Chemical Society, New York Section, held a joint meeting with the New York Section of the American Electrochemical Society, the Society of Chemical Industry, and the Société de Chimie Industrielle on Dec. 6, in Rumford Hall, 50 East 41st St. Officers for the New York Section of the American Chemical Society for the ensuing year were elected. Col. William H. Walker spoke on "The Manufacture and Use of Toxic Gases," and Col. Bradley Dewey had for his subject "The Manufacture of Gas-Defense Apparatus."

Industrial News

Chicago Pneumatic Tool Co., announces the appointment of L. C. Sprague as assistant secretary of the company, with headquarters at 52 Vanderbilt Ave., New York.

Superior and Boston Copper Co., of Arizona, has selected the following board of directors: W. G. Rice; George Kingdon; Garrett Mott, of Carleton & Mott; William F. Fitzgerald, of Fitzgerald, Hubbard & Co.; J. F. Barry, representing Clement, Parker & Co.; J. B. Hardon, representing Hayden, Stone & Co., and Homer Goodwin. This board will represent the owners of the property as they stand on the books of the company, and it has been agreed that all proxies will be cast in favor of the above.

Trade Catalogs

Halby Shoveling Machine. Lake Shore Engine Works. 9½ x 7, illustrated. A machine for mucking anywhere underground.

Driers. L. R. Christie Co., 307 Fourth Ave., Pittsburgh, Penn. 6 x 9, 4 pp., illustrated. Two pamphlets, one describing indirect-heat drier and the other the improved direct-heat drier.

Universal Displayors. Universal Fixture Corporation, 133 W. 23rd St., New York. 9 x 11; 6 pp.; illustrated. A folder, descriptive of map and chart displayors, as well as bulletin boards for wall and floor. Full details and prices will be furnished upon request.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alloy of Gold, Platinum and Palladium. George H. Dufour, Oak Park, Ill., assignor to Marshall Field & Co., Chicago, Ill. (U. S. No. 1,282,055; Oct. 22, 1918.)

Aluminum—Method of treating aluminous materials of high silica content. Charles M. Hall, Niagara Falls, N. Y.; Arthur V. Davis, Pittsburgh, Penn., and Homer H. Johnson, Cleveland, Ohio, executors of the will of said Charles M. Hall, deceased. (U. S. No. 1,282,222; Oct. 22, 1918.)

Aluminum—Reduction of Metallic Oxides. Paul R. Hershman, Chicago, Ill., assignor to the Mineral Products Co., New York, N. Y. (U. S. No. 1,273,220; July 23, 1918.)

Alunite, Utilization of. Richard Moldenke, Watchung, N. J. (U. S. No. 1,282,273; Oct. 22, 1918.)

Blast Furnace, Method of Desiccating Air for Use in. Leon Goldmerstein, (now Leon Cammén), New York, N. Y. (U. S. No. 1,282,686; Oct. 22, 1918.)

Electrolytic Process. Matthew M. Merritt, Danvers, Mass., assignor to Copper Products Co., Boston, Mass. (U. S. No. 1,282,262-3-4; Oct. 22, 1918.)

Explosive. Pierre E. Haynes and Harold E. Thompson, Buffalo, N. Y., assignors to the Linde Air Products Co., Cleveland, Ohio. (U. S. No. 1,282,229; Oct. 22, 1918.)

Furnaces, Regulator for Electric. Frank W. Smith, Westfield, N. J. (U. S. No. 1,282,478; Oct. 22, 1918.)

Hoist. William Lamb, Detroit, Mich. (U. S. No. 1,282,438; Oct. 22, 1918.)

Leaching Copper Ores, Process of. Albert W. Hahn, El Paso, Tex. (U. S. No. 1,282,415; Oct. 22, 1918.)

Leaching Process and Apparatus for Extracting Metals From Ores. Frank L. Antisell, Perth Amboy, N. J. (U. S. No. 1,282,521; Oct. 22, 1918.)

Ore Dressing—Screening Apparatus. Willard D. Richardson, Hebron, N. D. (U. S. No. 1,282,127; Oct. 22, 1918.)

Ore-Screen. John Nicholls, Globe, Ariz. (U. S. No. 1,282,108; Oct. 22, 1918.)

Steel, Manufacture of. Samuel S. Wales, Pittsburgh, Penn. (U. S. No. 1,282,660; Oct. 22, 1918.)

Tungsten, Process for Producing Ductile. Carl A. Pfanstiehl, Waukegan, Ill., assignor to Pfanstiehl Co., Inc., North Chicago, Ill. (U. S. No. 1,282,122; Oct. 22, 1918.)

Editorial Correspondence

SAN FRANCISCO—Dec. 6

The Chrome Mining Industry in California has suffered a setback that in some counties and districts has caused a collapse of such moment as to send the miners and prospectors off pocket hunting and reopening hydraulic and placer mines. Word comes from Washington that imports from Australia, Brazil, and New Caledonia will be stopped, though Canada and Cuba cannot be discriminated against. It seems to be the habit of statesmen who are opposed to the development of the mineral resources of America to cry discrimination, if protection of a newly developed mineral is asked. It does not matter to this class of lawmakers how much discrimination is practiced against California or Oregon or any other Pacific Coast state or any state. Large amounts have been expended in the development of chrome and manganese deposits and the building of motor roads in the last year in California and Oregon. Some of the investors have been able to reimburse themselves and were ready to begin taking out a little profit. Others have not yet got even with the game. The seesawing of the men in charge of whatever bureau or department of the Government is responsible for the situation has been a source of discouragement to a large number of small operators and caused appreciable losses to companies working on an extensive scale. California and Oregon responded quickly when the Government sent out the chrome and manganese S. O. S. But Washington doesn't seem to see the signal when the miners' ship is to be saved.

WALLACE, IDAHO—Dec. 7

The Hercules Mining Co. and the newly incorporated Sherman Lead Co., having adjacent properties and both being controlled by the Days, have adopted a novel plan to dispose of waste rock. The Sherman is driving a long crosscut starting in the town of Burke, which lies in a narrow canyon and has buildings so compact that there is no room for a dump. The Hercules disposes of most of its waste by filling in old stopes, and the surplus has heretofore been hauled away by the railroad companies for a nominal price and used for grade fillings. Under Government control of railroads there has been delay and annoyance in handling the waste, so the Hercules joined the Sherman in a plan to secure relief. A loading station has been built below the portal of the Sherman tunnel and accessible to the Hercules. From this station a bucket tramway has been run to a point just over the mountain on the opposite side of the narrow canyon, where the waste rock is automatically dumped. This tramway is driven by electric power and seems to solve the question of dumpage, which has long been a serious problem at Burke.

SALT LAKE CITY—Dec. 5

The Mine Occupation and Privilege and Net Proceeds Taxes on Utah Mines became delinquent Nov. 30, and payment of the net proceeds tax has been refused by nearly all of the 486 mining companies in the state. Some companies have paid it under protest, with notice to the state treasurer that they will take legal steps to recover it. The mine occupation and privilege tax was not opposed. The net proceeds tax is a supplemental tax passed in March, 1917, and operative this year for the first time; it became a law too late to apply to 1917 taxes. The total amount assessed under the net proceeds tax of 3% would be $989,341. Seven companies, whose combined assessment under the tax was $695,429, tendered the occupation tax of $1, but refused to pay the amount on the net proceeds. One of these was the Utah Copper Co., against which $664,503 was assessed. Thirteen other companies, which were assessed at $91,179, paid the amount under protest. The one company to pay in full, without protest, was the Ophir Coalition Mines Co., which tendered $1 as an occupation tax and $607.53 as the assessment against the net proceeds. The Mineral Products Co., of Marysvale, Piute County, is understood to have paid 3% on its net proceeds some time ago, though the company is not solely a mining company, but more or less of a manufacturing enterprise. Some of the principal mining companies that refused payment of the 3% tax, and the amount assessed against them, follow: Utah Copper, $664,504.30; Utah Apex, $12,052.40; Scofield Coal, $1,574.30; Cameron Coal, $2,497.04; Silver King Consolidated, $11,725.00; Grand Central, $3,675.65; Gold Chain, $408.38. Companies which paid both items of the tax but under protest, together with the amounts paid, include the following: Independent Coal and Coke, $5.143.69; Dragon Consolidated, $1,963.69; Colorado Consolidated, $751.72; Swansea Consolidated, $98.11; Iron Blossom Consolidated, $4,928.20; Spring Canyon Coal, $3,581.05; Bullion-Beck, $926.20; United States Fuel, $21,594.22; United States Smelting and Refining, $21,771.55; Centennial Eureka, $8,618.05; Naildriver, $85.96; Ontario Silver, $710.86; and Utah Consolidated, $21,006.43. On the third Monday in December, after delinquencies shall have been properly advertised, State Treasurer D. O. Larsen says, the properties of mining companies which have refused to pay the 3% net proceeds tax and the $1 occupation and privilege tax will be offered for sale at public auction. The penalty on the $1 occupation tax is 3%, if paid before the day of sale, plus cost of advertising. The penalty on the 3% net proceeds tax is 5% thereof, and in addition interest at 12% per annum, together with all costs of advertising and sale. Though the treasurer can sell mines for unpaid taxes the same as any other property, the owner has four years in which to redeem his property. The treasurer may also institute a suit, which would bring up the constitutionality of the act immediately, to bring it to an issue, otherwise the mining companies would probably have to seek to enjoin the sale of their property. The larger companies will, in all probability, institute a separate suit against the state treasurer to recover any taxes paid, taking such action for self-protection and to test the constitutionality of the law. Later a stipulation may be entered into to consolidate the cases and take one for a test case. Whatever way the lower courts decide, the case will be taken to the Supreme Court of the United States. Some mining attorneys hold that the state has a right to impose a tax of $1 as an occupation or license tax, but has no right to impose a tax of 3% as a revenue measure on net proceeds, in addition to the tax on the same net proceeds imposed by another statute. According to the constitution, the net proceeds are determined and assessed at their actual amount. Leading mining attorneys here hold that the act regarding net proceeds tax is unconstitutional and should have a legal adjudication as soon as possible.

PHOENIX, ARIZ.—Dec. 9

Capt. James P. Hodgson declined reëlection as governor of the Arizona Chapter of the American Mining Congress, at its recent annual meeting, an office he has filled for two terms, and, upon nomination, Norman Carmichael, manager of the Arizona Copper Co. Ltd., was chosen to the place. All other directors were reelected. The vice-governors are Robert E. Talley, of Jerome; W. B. Gohring, of Warren; and B. H. Dowell, of Bisbee. J. E. Curry, of Bisbee, was reëlected secretary, and H. J. McClung, of Phoenix, is treasurer.

DENVER—Dec. 8

Colorado Metal-Mining Association will hold its sixth annual meeting at the Brown Palace Hotel, in Denver, Jan. 2, 3, and 4, 1919, to elect directors from the various metal mining counties and to transact other business. The association urges all mining men of the state to meet with it in joint session with the Colorado Chapter of the American Mining Congress, so as to come to an agreement on concrete plans regarding matters vitally affecting the future of the mining industry in the state. Each metal mining county is entitled to five delegates with one vote each in the annual meeting, and five alternates; provided that any county may elect 10 delegates with one-half vote each, and 10 alternates; and provided, further, that if fewer than five delegates attend from any county, those attending shall have the right to vote proxies of absent delegates, the total vote not to exceed five from any county. The State Commissioner of Mines, the secretary of the State Bureau of Mines, the president of the Colorado School of Mines, the State Geologist, the chief representative of the U. S. Bureau of Mines, and the chief representative of the U. S. Geological Survey will be delegates-at-large, and entitled to one vote each. Mining men of the state are holding county conventions for electing delegates to attend the annual meeting, the program for which is being arranged. Secretary Callbreath of the American Mining Congress is expected from Washington to give those present at the meeting the latest developments at the Capital concerning matters affecting the mining industry. Bulkeley Wells, governor of the State Chapter, will also be present. Among the other subjects to be discussed by prominent speakers will be the proposed changes in the Industrial Commission and Compensation Laws, proposed blue-sky laws, and Government control of labor supply. Plans are being made for several prominent speakers from without the state. Despite unfavorable conditions of the industry, the meeting promises to be one of the most important ever held in the history of the organization. George M. Taylor is president of the Colorado Metal-Mining Association, and M. B. Tomblin is secretary. The permanent office of the association is at 324 Tabor Opera House Bldg., Denver.

Colorado Producers of Tungsten, manganese, chrome, and pyrites are arranging for representation at the meeting to be held by the American Mining Congress in Washington Dec. 16 and 17, to confer with Secretary Lane on relief measures proposed by him to prevent disaster to these industries, which are threatened by imports from cheap-labor countries. Producers of the minerals think that the Government has assumed a moral obligation by making appeals to producers of so-called war minerals, and inducing them to make heavy investments. Many cases of acute personal distress have been the result. Regarding tungsten, it is well known among those most interested that foreign producers are planning to deliver to this country any quantity of high- or low-grade ores and concentrates that the market can absorb, and at prices below the cost of production in this country. The same conditions are true regarding molybdenum. Practically all hope of manganese producers has been abandoned and those who were recently interested in the development of this metal and its minerals are acting on the assumption that the market is permanently destroyed, so far as domestic operations are concerned. It is with a forlorn hope that producers view the agitation for a protective tariff on war metals, because they realize that the consumers outnumber the producers, and that if legislation is to be designed with a view to the greatest good to the greatest number, home industries based on the production of these minerals will be throttled.

Owners of Unpatented Mining Claims desiring to take advantage of the law suspending assessment work during 1917 and 1918 must file their declaration of intention again this year to hold their claims under this law. This notice must be on file with the clerk and recorder of the county in which the claims are located, not later than Dec. 31. Failure to file this notice will work a forfeiture as against a third party.

BATESVILLE, ARK.—Dec. 8

The Batesville Manganese Field is in much the same condition as other manganese fields in the United States. The market for the ore has been dull for the last three weeks. A few shipments are going out, but tonnage is light. There is no panic among operators, however. A reaction was expected at the end of the war. They look for a market again within a few weeks, and, though they do not hope to get as much for their product as they did during the war, they expect a price on which they can operate. A committee composed of Walter H. Denison, of Cushman, and A. A. Edwards and D. D. Adams, of Batesville, returned from Washington, D. C., on Dec. 7, where they were sent by manganese interests in the field to inquire into the

factors which would be likely to affect the industry during the reconstruction period. They are not pessimistic, but believe that every effort should be made to secure the protection necessary to maintain the industry on a sound basis, and that this can be had by putting the War-Minerals Bill into effect. A meeting of operators will be held at Batesville soon to select a committee to go to Washington to represent the interests in this field at the American Mining Congress.

CLEVELAND, OHIO—Dec. 3

Iron-Ore Shipments from the Lake Superior ranges closed with a total Lake movement of 61,156,732 tons, according to *Iron Age*. Shipments during November amounted to 4,279,025 tons, as compared with 7,331,804 for that month last year. Only one cargo of 6836 tons was shipped in December, as compared with over 900,000 shipped during December of the two previous years. With the all-rail shipments, which will not be known until the close of the year, the movement for the season will be close to 63,000,000 tons. The movement was curtailed during the latter part of the season to divert boats to the grain trade, a number of consumers agreeing to have some of their ore carried over until next year. However, as the requirements were figured on a war-time basis, there is no question that all consumers will have an ample supply of ore to last them until next season.

TORONTO, ONT.—Dec. 10

A New Natural Gas Field for the supply of the Calgary district of Alberta has been opened up by President Eugene Coste of the Canadian Western Natural Gas, Light, and Power Co., about 30 miles east of Lethbridge. Drilling was begun in July and gas struck Nov. 7, with an initial production of 4,000,000 cu.ft. in 24 hours. The well will be connected with the main line from the Bow Island field, supplying Lethbridge, Calgary, and other places. The company is planning for an extensive development of the new field.

Metal Production of Ontario for the first nine months of 1918, according to returns to the Ontario Bureau of Mines from mines, smelteries, and refineries of the province, was as follows: Gold bullion produced, $6,875,766, an increase of $125,000 over the same period of 1917; silver, 13,145,596 oz., a decrease of 2,000,000 oz. The output of metallic cobalt, cobalt oxides, nickel oxides and other compounds of these metals showed increases in value. Molybdenum produced was 43,631 lb. Pig lead output decreased in value. Nickel in matte amounted to 33,508 tons, an increase of 2500 tons. Copper in matte was 17,052 tons, as compared with 15,928 tons for the 1917 period. The output of copper ores was negligible, and iron ore, at 154,243 tons, showed an increase of only 16,000 tons. Pig-iron production was 541,564 tons, an increase of 28,000 tons.

Rights of Prospectors are affected by a decision of importance recently given by Mining Commissioner T. E. Godson in an action brought by R. N. Austin against W. W. Cochenour, L. B. Howie, M. R. Howie, and George T. Martin, claiming an interest in the Howie-Cochenour property in the Lightning River district. By an agreement entered into with Cochenour and associates, Austin was to have an interest in claims recorded by them and all such other claims as should be staked before Oct. 1, on condition of paying the purchase price in installments, in order to enable the claim owners to perform assessment work and carry on prospecting. Austin made some payments and then fell in arrears. After the Lightning River discovery was made, he desired to pay up the amount overdue and be reinstated. The commission dismissed the case on the ground that, though the agreement contained no specific provision to that effect, the nature of the transaction implied that time was the essence of the contract, and that Austin forfeited his claim to an interest when he defaulted.

J. Forsyth Smith, Canadian Trade Commissioner at Glasgow, Scotland, reporting on the prospects for marketing molybdenum concentrates in Great Britain, says that at present all molybdenum supplies are controlled by the Ministry of Munitions and that there is rather a slump in the market—the output being in excess of requirements. In 1915 the government fixed the price at 105s. ($25.55) per unit of molybdenum sulphide per ton of 2240 lb., delivered in England, less 1% brokerage charges. The price has since been increased to 120s. ($29.20) per unit. On the basis of 85% purity this is about 4s. 6d. ($1.09) per pound. It is difficult to forecast post-war requirements for molybdenum on the British market, as it was not largely used before the war, tungsten, with which it is interchangeable for many purposes, being much better known by steel manufacturers. As a result of the unsteady demand before the war, prices were uncertain. A pre-war price of 60s. ($14.60) per unit per ton rose as high as 160s. ($38.93) per unit before controlled prices were fixed in 1915. The market for molybdenum is governed largely by the prices ruling for tungsten. In general, it is considered that one part of molybdenum is equal to two parts of tungsten. In order, therefore, to make molybdenum attractive to the steel-maker, the price per unit of metal contained in the ferro-alloy must be rather less than double the price per unit of tungsten in the corresponding alloy. In the past the price of molybdenum has greatly exceeded this ratio to that of tungsten, and this, together with the fact that tungsten is said to be more easily dealt with in the melting furnaces, has, up to the present time, given the latter the preference with steel manufacturers. Though unable to speak positively, on account of unknown factors, metal importers generally agree that there is likely to be a fair and increasing demand for molybdenum, and that, subject to the important considerations of price and dependability of supply, producers should have no difficulty in marketing reasonable quantities. Australia and Norway will be the principal competing sources of supply, the Australian product being of high grade, ranging from 90 to 95% of MoS_2. A number of British firms are producing ferromolybdenum for steel-makers' use, so that the demand for this product is likely to be less than for the concentrates. Several firms have expressed an interest in getting in touch with Canadian producers.

VICTORIA, B. C.—Dec. 7

The Consolidated Mining and Smelting Co.'s smeltery at Trail treated 271,417 tons of ore in the first 10 months of 1918, compared with 327,639 tons in corresponding period of 1917, and 415,983 tons in same period of 1916. A. C. Langley, provincial resident engineer for No. 5 Mineral Survey District, roughly compiles the tonnages sent to Trail in the first 10 months of 1918 from the several mining divisions under his supervision, as follows: Slocan, 13,097 tons; Ainsworth, 16,249; Slocan City, 157; Fort Steele, 81,528; Windermere, 2339; Nelson, 3934; Golden, 803, and Trail Creek, 105,897 tons. Thirty-four properties, which made small shipments in 1917 are listed as having been dropped from the shipping list in 1918.

The Mining News

ALASKA

ALASKA GOLD (Juneau)—Dry tons milled in November was 94,395; calculated heads, 0.963; extraction, 79.55%; and tails, 0.198.

KENNECOTT (Kennecott) — November production was 12,146,000 lb. of copper.

ARIZONA

Cochise County

PHELPS DODGE (Bisbee)—November smeltery output was 15,785,011 lb. of copper, of which 1,841,920 lb. came from custom ores and 13,943,091 lb. from mines of company. Of latter figure Mexican properties yielded 3,551,418 pounds.

SHATTUCK ARIZONA (Bisbee)—November production was: Copper, 583,655 lb.; lead, 514,127 lb.; silver, 11,296 oz., and gold, 86.03 oz. Production for 11 months in 1918 was: Copper, 8,575,627 lb.; lead, 2,019,097 lb.; silver, 139,724 oz., and gold, 1134.14 ounces.

CALUMET & ARIZONA (Warren)—Smeltery production during November was 5,718,000 lb. Available for Calumet & Arizona, 3,898,000 pounds.

Gila County

OLD DOMINION (Globe)—November production was 2,101,000 lb. of copper.

INSPIRATION (Miami)—November copper production was 7,500,000 pounds.

MIAMI (Miami)—November production was 4,382,730 lb. of copper, compared with 4,945,178 lb. in October.

Pima County

NEW CORNELIA (Ajo)—November production was 3,264,000 lb. of copper.

Yavapai County

JEROME VERDE (Jerome)—Shipping 22 tons of high-grade ore per day.

SHEA (Jerome)—Making small shipments of silver-copper ore to Verde smeltery.

UNITED VERDE EXTENSION (Jerome)—Completing large apartment house for miners; is part of general housing scheme.

PECK (Prescott)—Frank H. Giroux appointed manager for new operating corporation headed by L. G. Kirkland, of Chicago, and C. E. Batton. Installing new ball mill, with Wilfley tables and 14 cyanide tanks to handle old dump of 20,000 tons, sampling high in silver.

FRANCO-AMERICAN (Stoddard)—Operating New Year's group, adjoining Stoddard property. Lately purchased on bond by Washington capitalists, represented locally by Fred Bowler. Compressor to be installed.

ARKANSAS

Independence County

OZARK (Batesville)—Installing dry process plant to recover fines. Production of nugget ore good. Shipped last car week ago.

TRENT (Batesville)—Developing manganese orebody by open cuts. Operated by owner, T. J. Walburt, with W. T. Barr.

WACO MANGANESE (Batesville)—Operating Patterson mine on Bayou. Has purchased steam shovel, Keystone No. 6.

WREN HILL (Batesville)—Operated by Polk Kendall and associates. Has two shafts in high-grade manganese, one 73 ft., which has cut three runs, other 25 ft., which is in first run.

EUREKA (Cushman)—Installation completed of three sets of three-cell and one set of two-cell jigs, to be used with log washer on manganese ore. Capacity of reservoir increased to 250,000 gallons.

KLONDYKE (Cushman)—E. W. Buskett and associates will build washery. Manganese deposit developed by shaft.

CALIFORNIA

Amador County

FREMONT (Drytown)—Closed down at end of November owing to prohibitive costs of gold mining. Pumps and other machinery pulled out of shafts. Prospective buyers said to be looking over property. Mine timbers and some other materials sold to Plymouth mine. Has been operating for many years, usually at profit.

CENTRAL EUREKA (Sutter Creek)—New ore reported. Twenty stamps of 40-stamp mill dropping on good-grade ore.

Inyo County

WILSHIRE-BISHOP CREEK (Bishop)—New flotation plant installed and tests made on dump ores showed 87 per cent. saving. Higher recovery expected in treatment of fresh ore. Rated capacity 100 tons a day. Crushing capacity of mill 60 tons. Employ 25 men. New Leyner drill installed. Mark Gillman is superintendent.

Madera County

CALIFORNIA COPPER (Madera)—Ore dumps at mine and smeltery site leased to W. T. Perry, of Fresno, to be concentrated. Aggregate about 200 tons.

Nevada County

HYDRAULIC MINING in region of Dutch Flat and You Bet active in preparation for winter work. Liberty Hill mine dam, in Bear River, being raised 50 ft.; eight miles of flume and ditch rebuilt, ready for piping. California Placers raising dam in Missouri Canyon, below You Bet. Drifting at Quaker Hill this winter in preparation for hydraulic work next season.

KIRKHAM (Mountain House)—Installing reduction mill to treat gravel.

MAYFLOWER (Nevada City)—To develop in conjunction with Sharp Consolidated. Equipment includes hoist and 20-stamp mill. Small orebodies have been explored.

Plumas County

COAL DEPOSIT in north end of Plumas County reported at Quincy. Development under consideration.

TRASK & COFFER (Greenville)—Started crushing ore in new mill. High-grade copper ore reported. L. Coffer is manager.

BUSHMAN (Quincy)—Rich gravel reported. Prospecting to discover connection with old channel, formerly large producer.

Shasta County

CHROME ORE HAULING by motor truck from Cow Creek to Castella for rail shipment abandoned for winter on account of snow on divide; 300 tons on divide may be brought down.

AFTERTHOUGHT COPPER (Ingot)—Construction of new electrolytic plant, delayed by labor shortage caused by influenza, now resumed. Underground development discloses large ore reserves.

MAMMOTH COPPER (Kennett)—Smeltery supplied with ores from Shasta King, Balaklala and Bully Hill. Development in main Mammoth property continues.

Siskiyou County

HYDRAULIC MINING to be active in Callahan, Forks of Salmon, Oak Bar, Seiad, Scott Bar and other districts during season. Early snow indicates abundance of water. Placer mining on Klamath River and on Salmon promise fine season. Collapse of chrome industry to some extent accountable for revival of hydraulic and placer mining.

COLORADO

Boulder County

LOGAN (Boulder)—After repairing over 1000 ft. of workings, lessees M. Smith and A. S. Coan have opened shoot of payable ore 400 ft. long on Teller vein, and made trial shipment. Vein is three feet wide, of which eight inches is shipping ore. Lessees Berryman and Ardourel taking ore from main Logan vein. Charles Wahlstrom sinking winze in Logan oreshoot below fourth level. Pockets of 60-oz. silver ore opened near junction of Logan vein with Yellow Pine Extension vein.

CARIBOU (Caribou)—Lessees McKenzie & Johnson operating on 740 level of No Name vein. Have blocked out considerable ore between 740 and 600 ft. levels. Expect to produce two carloads per week during next few months.

COLORADO TUNNEL (Crisman)—Being driven on contract for Colorado Mining and Milling Co. to prospect Kink & Carlson property. Will run 100 ft. and toward oreshoot which yielded 10% tungsten ore near surface. Property under development includes part of Fortune Dyke, Jewel, and King No. 1 mines. Two small veins cut by tunnel assay small amounts in gold and silver.

KING (Summerville)—Being developed by Hoosier Dyke Mining Co., of which J. L. Rinehart is superintendent. Payable gold-silver ore opened on 300 level.

Clear Creek County

SILVER CREEK (Alice)—Crown Reserve Mining Co. will not exercise option on placer ground it has been testing.

COLORADO CENTRAL (Georgetown)—New modern heating plant installed at mill, which will run throughout winter.

ONONDAGA (Georgetown)—Leased by Harry Lees, who has developed shoot of payable ore.

Gilpin County

FRONTENAC (Central City)—Ress & Co., lessees, removing pillars on 400 level.

San Miguel County

ALTA MINES (Ophir Loop)—Shut down until next April, on account of labor shortage.

Teller County

FOREST QUEEN (Cripple Creek)—Operations resumed after shutdown on account of illness among workmen. Development progressing on bottom level, where payable ore has been opened. Edwin Gaylord is vice-president and general manager.

IDAHO

Boise County

GOLD HILL (Quartzburg)—Operated and controlled by Boston & Idaho Gold Dredging Co. Employing 65 men.

Shoshone County

SHERMAN (Burke)—Sherman Development Co. transferred all property to Sherman Lead Co., new corporation, and turned over 51% of capital stock to E. R. Day in return for advance of $100,000 to complete payment of bond of property and necessary capital to equip and develop same. Officers of new company are: E. R. Day, president and general manager; Charles McKinniss, vice-president, and H. R. Allen, secretary-treasurer.

NATIONAL COPPER (Mullan)—Winze from 1500 level down 75 ft. Will crosscut and explore vein at 100 ft. Much ore broken in upper levels. Mill running one shift for several months. Will put on another this month and probably third by Jan. 1. Low-grade copper.

MICHIGAN

Copper District

QUINCY (Houghton)—No. 2 shaft yielding large amount of mass and barrel copper, particularly from lower levels. Now practically 9000 ft. deep. Machinery for new hoisting plant to operate to 14,000 ft. being installed rapidly.

NEVADA

Churchill County

NEVADA WONDER (Wonder)—Mine opened to 2000 level. Mill operating steadily. Good progress made in reopening Monitor-Belmont mine, now operated by this company. Belmont and Highbridge shafts both equipped with hoisting plants, water lowered to 70 ft. below 200 level, and considerable footage of old workings reopened and retimbered. Development on deepest levels has opened new oreshoot.

Clark County

GREEN MONSTER (Goodsprings)—Shipping good-grade lead-zinc ore. Recent development has opened two oreshoots below 200 level. Mine operated by Walter Darrington, lessee.

Elko County

EXPERIMENTAL OIL SHALE PLANT of 20 tons daily capacity to be built near Elko by Southern Pacific R.R., assisted by petroleum department of Bureau of Mines, it is reported. Catlan Shale Co. has had 20-ton plant in operation for a year, and is now increasing capacity.

Esmeralda County

SILVER DISCOVERY made recently 20 miles south of Goldfield on Silver Moon and Silver Fox claims, owned by J. E. Peterson and J. Luckman, of Goldfield. Lessees have sunk 30-ft. shaft and will continue.

ATLANTA (Goldfield)—Large tonnage low-grade ore amenable to flotation treatment developed on lower levels. Important work on 1850 level.

CRACKER JACK (Goldfield)—Work resumed on larger scale. Drifting on east vein on 320 level. Winze started toward junction of this vein with West Cracker Jack vein. Five-year lease secured on 40 acres, covering part of consolidated Florence vein. H. G. McMahon is manager.

GRANDMA (Goldfield)—Drifting on 800 level along shale contact zone.

GREAT BEND (Goldfield)—Two stopes opened on 160 level now producing shipping-grade ore. Raise from 370 level opening ore of shipping grade. Considerable milling-grade ore developed. Treatment tests being made to determine remodeling necessary on old mill. J. K. Turner is consulting engineer.

MERGER (Goldfield)—Milling-grade ore opened above 175 level in shale contact.

RED HILL FLORENCE (Goldfield)—Shipping regularly. Crosscut on 600 level has entered Rogers vein.

SILVER PICK CONSOLIDATED (Goldfield)—Peculiar occurrence of high-grade molybdenum ore encountered on 1260 level recently. No oreshoot of commercial size found so far. Main shaft being sunk another 50 ft. to prospect quartz oreshoot further.

SPEARHEAD GOLD (Goldfield)—Good-grade ore opened 600 ft. south of main shaft on 910 level. Shoot similar to that opened in shale on Jumbo Extension four years ago. Geologically, discovery of ore in shale at depth very interesting to Goldfield operators.

Humboldt County

KRAMER HILL (Golconda)—Shipping from 40-ft. shaft and surface pits. Small amount of development work done; several leases made, and extension work to be started at once. Property three miles south of Iron Point station.

SILVER STATE (Packard) — Milling operations curtailed for week to permit changes in plant. Mill has been treating 120 tons daily. Development progressing.

ROCHESTER (Rochester) — Sinking winze in ore on 11 level. Driving footwall drift in ore on 10 level. Stoping on 7 level and Hunter lease gloryhole.

INDIAN CREEK (Unionville)—High-grade gold-silver ore being shipped.

QUARTZ HILL (Winnemucca)—Copper property five miles west of Winnemucca being developed.

Lander County

MANGANESE DISCOVERY made near Reese River Valley, 16 miles from Austin. Deposit said to be opened by cuts and tunnels.

FARETTA CINNABAR (Battle Mountain)—New reduction plant of 12 retorts in Jersey section of district to be operated in few weeks. Property owned by M. D. Faretta, Frank Childress, and John Ross, of Battle Mountain.

Lincoln County

GROOM (Groom)—To resume operations.

Mineral County

WALL STREET (Luning)—Shipping ore, grade of which is limited by long pack and wagon haul to railroad. Better transportation facilities would permit larger shipments of lower-grade ore.

Nye County

LABOR SHORTAGE in Tonopah district keenly felt. Federal Industrial Commission notified that 100 men can be employed at once. War conditions and then influenza greatly depleted forces of mines, resulting in reduced tonnage.

MAYFLOWER (Pioneer)—Milling plant will be remodeled and enlarged. W. J. Tobin, manager.

PIONEER (Pioneer)—Sinking shaft to 900 feet.

TONOPAH DISTRICT ore production for week ended Nov. 30 was 7189 tons, having a gross milling value of $122,213. Producers were: Tonopah Belmont, 1766 tons; Tonopah Mining, 1100; Tonopah Extension, 2226; West End, 1067; Jim Butler, 150; Montana, 105; Tonopah Divide, approximately 200; MacNamara, 401; Rescue, 64; Halifax, 70, and miscellaneous, 40 tons.

CASH BOY (Tonopah)—Sinking of shaft stopped at 1656-ft. point. Station cut at 1546 ft. Direct hoisting to surface now possible.

GOLD WEDGE (Tonopah)—Sinking shaft on this property in southern part of New Divide district.

GREAT WESTERN CONSOLIDATED (Tonopah)—Enlarging shaft. Additional pump installed.

JIM BUTLER (Tonopah)—October production was 1054 tons, netting $5942. Treated at Tonopah-Belmont mill. Drifting on 800 level from Wandering Boy shaft. Prospecting for faulted segment of Fraction vein in crosscut from 815 winze. Raising from 600 level, also from 200 level of Fraction shaft.

TONOPAH BELMONT (Tonopah)—Has found faulted segment of South vein.

TONOPAH DIVIDEND (Tonopah) — Electric power installed. Cross-cutting east and west on 300 level to cut Brougher and a parallel vein. Road to mine completed, and telephone lines to Tonopah installed. E. P. Cullinan, manager.

TONOPAH EXTENSION (Tonopah)—Working deepest level in district. Sinking Victor shaft from 1700 to 1800 level. Pumps installed on 1680 level handling water successfully; one will be lowered to 1760 level. Much lateral development work planned on 1800 level when reached; 133 ft. new development work done in third week in November.

WEST END CONSOLIDATED (Tonopah)—Managing heads will have offices at company headquarters in Syndicate Bldg., Oakland, California.

WEST TONOPAH (Tonopah)—Installing pump to lift 1000 gal. per min. from 1100-ft. depth.

Storey County

MEXICAN (Virginia City)—Ore crushed at mill during week ended Nov. 30 was: Consolidated Virginia, 475 tons, averaging $21.23; Mexican, 72 tons, averaging $22.76, and Ophir, 67 tons, averaging $9.87. Mill ran 88% of time.

NORTH END (Virginia City)—Production for third week in November was: Union, 142 tons; Consolidated Virginia, 382 tons; Mexican, 133 tons, all treated at Mexican mill. Advancing east drift in Mexican mine on 2300 level and producing good-grade ore from winze in south drift. Developing on 1900, 2000 and 2200 levels of Consolidated Virginia.

White Pine County

MINING REVIVAL in Cherry Creek district under way. Eagan mine leased to J. W. Walker and being reopened. Lessees operating Pine Nut and Black Metal properties are shipping. J. W. Walker has recently transferred interest in lease on Mary Ann mine to New York men, who will install machinery and continue work on larger scale.

CONSOLIDATED COPPER MINES (Kimberly)—October production of 1,479,024 lb. copper came chiefly from Kimberly operations, as only 7100 tons was shipped from Ora claim at Liberty pit. Kimberly mill made 78.6% extraction for month. Recent developments in Alpha mine encouraging. Stopes above 1200 level improving in grade. Up to Nov. 20, over 2000 tons of 7.9% copper ore shipped from 1200 level. Crosscut from Alpha shaft on 1300 level being pushed to explore downward continuation of orebodies.

NEW MEXICO

Grant County

ATWOOD (Lordsburg)—Will install compressor at shaft being sunk on Southern group. Will sink 200 ft. and drift under Atwood ground 350 ft. below collar of old shaft. J. Tangye, superintendent.

EIGHTY-FIVE (Lordsburg)—New mill handled 275 tons daily for last month. James Jackson, mine superintendent.

CALUMET (Pinos Altos)—Development of property begun in July, 1918. Flotation machines and other concentrating equipment purchased from Colorado Iron Works. Property, lead-zinc. J. A. McCallum in charge.

GREAT EAGLE (Redrock)—November shipments were about 800 tons of fluorspar. Fred Kroll, manager.

OREGON

Jackson County

RAY & HAFF (Gold Hill)—This group of gold mines, with Sylvanite group, three miles north of Gold Hill, now operated by Gold Hill Mining Association, recently organized with office at Medford, Ore. Property under lease to J. G. Davies, of Sacramento, Calif., during last year.

SOUTH DAKOTA

Lawrence County

HOMESTAKE (Lead)—Golden Star mill with 200 stamps is closed, owing to labor shortage, making 300 stamps idle; 720 dropping. Hardinge mill on ground for months not set up, also because of the lack of men.

UTAH

Beaver County

CAPITOL (Milford)—Has purchased new hoist good for 1000 feet.

Juab County

TINTIC SHIPMENTS for week ended Nov. 22 were 127 cars by 17 shippers, as compared to 126 cars the week preceding. Dragon Consolidated, Iron Blossom and Tintic Standard were the heaviest shippers. Shipments for week ended Nov. 29 were 106 cars by 18 properties. Light production due to labor shortage. Conditions as to influenza are improving.

COPPER LEAF (Eureka)—Work of following ore cut in shaft at 915 ft. resumed after suspension due to flow of gas, which has been removed. John W. Taylor is superintendent.

EUREKA LILLY (Eureka)—Sinking of inclined winze to be resumed under contract. Grant Snyder is manager, succeeding R. S. Edwards, resigned.

GRAND CENTRAL (Eureka)—November output 30 cars, compared with 27 cars in October. Production during first six months of year, 288 cars, or about 12,000 tons.

LEHI TINTIC (Eureka)—Development work being done in north Tintic. Gas flow stopped work in winze following ore streak, now 130 ft. below tunnel. New tunnel being driven to winze.

TINTIC STANDARD (Eureka)—Main working shaft now 1475 ft. deep, sinking from 1263 point being nearly finished. Stations being cut at 1250 and 1350 levels. New orebody proving very large. Principal value in silver. Shaft in ore of shipping and milling grade from 1260 ft. to present depth. Further sinking proposed after stations are finished. Production week ended Nov. 29 was 600 tons.

ZUMA (Eureka)—Shaft driven 750 ft. Proposed to drift at 800 ft. Country rock, limestone and porphyry. Property is in east Tintic.

Salt Lake County

ALTA CONSOLIDATED (Alta)—Ore in Braine fissure, recently opened in workings from Copper Prince tunnel, runs well in lead, silver and copper; also small amount of gold. Drifting on this ore to west along fissure. Sulphide ore being accumulated for shipment. Car of lead-carbonate ore shipped.

MICHIGAN-UTAH (Alta)—New tram unable to handle output. Next spring capacity to be enlarged and line lengthened. At present extends from mine to Tanners Flat, 4½ miles. To be extended to Wasatch. Present capacity 100 tons per day.

GARFIELD SMELTERY, A. S. & R. (Garfield)—New fire-alarm system installed, under supervision of A. J. Coffee, representative of Gamewell Company, San Francisco. Work on this began several months ago.

ALTA TUNNEL AND TRANSPORTATION (Salt Lake City)—Following ore in raise and west drift from tunnel, about 3200 ft. from portal. Fissure four feet wide and being followed to reach contact of shale with overlying limestone. Principal value, lead and silver.

UTAH COPPER (Salt Lake City)—Offices of company and of Bingham & Garfield R.R. moved from McCornick Block to three upper floors of new Deseret National Bank Bldg., on Dec. 1.

Summit County

PARK CITY SHIPMENTS for week ended Nov. 22 were 3,528,900 lb. of ore and concentrates. Figures include 560,040 lb. of spelter from Judge Mining and Smelting. Shipments for week ended Nov. 29 totaled 3,775,960 lb. of ore and concentrates. Output slightly below normal.

ONTARIO SILVER (Park City)—New development work being done on 1300 level and in some upper workings from which lessees are producing. Company's present production from 1600 and 1700 levels. Shipments about 500 tons per week. November output was 2450 tons, October, 2235. Production for first 11 months of 1918 estimated at 30,600 tons.

SILVER KING CONSOLIDATED (Park City)—New 150-ton mill warming up on ore from old California-Comstock workings. Principal value in lead, silver, and zinc. Flotation used. About 30 men employed in mine and mill. New drain tunnel now 8800 ft. and advancing to get under California-Comstock workings and D. & M. section of property; now in Woodside shale.

WASHINGTON

Lincoln County

CRYSTAL (Miles)—E. S. Campbell and associates, of Spokane, have option on property and are unwatering it. Company owns 40 acres. Shaft down 200 feet.

Stevens County

UNITED COPPER (Chewelah)—Mill handling 275 to 300 tons, but will soon increase to capacity of 600 tons. Conrad Wolfle, president, states there is 14 ft. of ore on 1200 level north and high-grade body being opened on 1300 south. Latter followed by 50 ft. drift. Copper King claim being drilled.

LOON LAKE BLUE BIRD (Loon Lake)—Has installed compressor and added boiler and other equipment.

SPOKANE COPPER (Loon Lake)—Pushing development work.

ADMIRAL (Valley)—Work resumed under management of J. Richard Brown, Spokane. Will run 80-ft. crosscut from lower level to block out additional orebody 100 by 300 ft. Bond issue of $75,000 authorized for equipment and development. Will install compressor and power plant.

CANADA

British Columbia

PRODUCERS' (Jedway)—Preparing to develop silver-copper property on Moresby Island. Providing 10-in. pipe to feed 48-in. Kincaid waterwheel. Compressor plant brought from Vancouver. Expect to drive 250-ft. tunnel to vein. Frank Buckingham will have charge of mining operations.

CARTER & MARTIN (Stewart)—Bonded to Welch, Fetter & Carlton, Seattle. Crosscutting from 200 ft. tunnel to get under surface croppings. D. A. Harris in charge.

SALMON-BEAR RIVER (Stewart)—To ship sawmill and compressor over snow this winter and saw lumber next season for building concentrator. Silver-gold property 15 miles up Salmon River. R. K. Neill in charge.

BELLEVUE (Winnipeg)—Plan to erect 20-stamp mill this winter; 10 stamps received. Treatment by amalgamation and Deister Overstrom plates. Ore free-milling gold quartz. Will enlarge present camp. Thirty men employed. Two shafts sunk 40 and 70 ft. respectively. Property, four claims and fractions 25 miles east of Lake Winnipeg and three miles north of Hole River.

Ontario

CAMPBELL (Boston Creek)—Gold telluride discovery reported on claims.

MILLER INDEPENDENCE (Boston Creek)—Will increase capital from 500,000 to 700,000 shares. New development renders present mill capacity of 40 tons daily inadequate.

ADANAC (Cobalt)—New vein six inches wide struck in crosscutting on 310 level.

GIFFORD (Cobalt)—Two veins, heavily mineralized, and several stringers encountered on 390 level; supposed to be continuation of Beaver vein system.

KERR LAKE (Cobalt)—Will not erect its own concentrator, present contract with Dominion Reduction Co. being satisfactory.

MINING CORPORATION (Cobalt)—Has dropped option on silver-lead property near Revelstoke, B. C., recently acquired.

PETERSON LAKE (Cobalt)—Trial judgment of Justice Middleton that Peterson Lake was entitled to ownership of tailings deposited on its land by Dominion Reduction Co. was upheld in divisional court, and appeal of Dominion company dismissed.

CASTLE (Gowganda)—Crosscutting under way at 300 level to tap series of veins encountered in shaft.

CANADIAN KIRKLAND (Kirkland Lake)—Acquired by Drummond interests, of Montreal.

ELLIOTT KIRKLAND (Kirkland Lake)—Diamond drilling from 500-ft. level shows increase of porphyry formation at 600-ft. depth. Shaft will be sunk to that level.

ONTARIO-KIRKLAND (Kirkland Lake)—New electric plant ready for operation. Shaft will continue from 100 to 300 level. Property formerly under option to La Rose.

HOWIE-COCHENOUR (Lightning River)—Work suspended on account of impassable roads.

DAVIDSON (Porcupine)—Electric equipment now in operation.

DOME (Porcupine)—J. S. Bache, president of stock-brokerage house of that name, elected president to succeed late J. R. De Lamar.

McINTYRE (Porcupine)—Raise from 1200 level to 1000 level will soon be completed. Main shaft will then be sunk to next main haulage level, at 1375 ft., with two intermediate levels, and electric haulage system installed. Company's plans include sinking to still deeper levels.

SOVEREIGN (Porcupine)—President C. W. Moodie has underwritten 100,000 shares at 25c. per share, out of proceeds of which development will be resumed.

DOME LAKE (South Porcupine)—Started winze from 500 to 600 level. Three shifts employed. Charles A. Randall is manager.

MEXICO

Baja California

COMPAGNIE DU BOLEO (Santa Rosalia)—Copper production during October was 1,873,760 lb. Ore averaged 3.77% copper.

Sonora

CERRO COLORADO (Altar)—Bonded and leased for $150,000 to Frank W. Turner, of Yuma, Arizona.

GREENE CANANEA (Cananea)—November production was: Copper, 5,100,000 lb.; silver, 169,560 oz., and gold, 1330 ounces.

NACOZARI CONSOLIDATED (Nacozari)—Has purchased Tharsis York property from New York-Boston corporation and will continue adit tunnel, now in 2500 ft., to develop six-foot vein of copper, silver, and gold ore. Ground adjoins Moctezuma property.

The Market Report

SILVER AND STERLING EXCHANGE

Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
5	4.7565	101⅛	48 3/16	9	4.7570	101⅛	48 7/16
6	4.7565	101⅛	48 7/16	10	4.7570	101⅛	48 7/16
7	4.7575	101⅛	48 7/16	11	4.7570	101⅛	48 7/16

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Dec.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
5	*	†	7.05	6.75	8.00 @8.10
6	*	†	7.05	6.75	8.00 @8.10
7	*	†	7.05	6.75	8.00 @8.10
9	*	†	7.05	6.75	7.95 @8.05
10	*	†	7.05	6.75	7.95 @8.05
11	*	†	7.05	6.75	7.95 @8.05

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

* No market. Producers ask 26c. No buyers.

† No market. Major supplies held for distribution at an arbitrary price of 72½c.

LONDON

Dec.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
5	122	122	137	275	270	40½	39½	56
6	122	122	137	275	270	40½	39½	56
7	...	...	...	...	...	...	...	...
9	122	122	137	275	270	40½	39½	56
10	122	122	137	275	270	40½	39½	56
11	122	122	137	(a)	(a)	40½	39½	56

(a) Not received at time of going to press.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

NEW YORK—Dec. 11, 1918

The situation in the metal markets does not clear up in the sense that interested parties see their way any more plainly, but rather is it that the perplexities of the problems and their gravity become evident. It is also becoming perceived more clearly that the more that Washingtonian policies are dismissed from consideration, and the sooner the idea of nursing the markets is forgotten and things are allowed to take their own natural course, the better will it be in the end, although some of the immediate events may be uncomfortable. There is, however, one matter of relationship with Washington that requires consideration and judicious arrangement, and this is the matter of liquidating the surplus stocks of metals that are held by the Government. The producers can better attend to the disposition of them than can any Governmental bureau, but pending their liquidation, the Government ought to assist in the financing, for the producers are going to have enough financial burdens of their own.

The need for reopening commercial relations with Europe in a normal way is another thing that is becoming pressing. Even if we do not sell any of our copper and zinc there, the Mexican lead that is refined in this country must be sold there. The delay in cable communications is a troublesome feature at present, a week being required for obtaining a reply to an inquiry.

Copper.—In making our report last week we indicated a change in the situation in copper and reserved the right to correct our representation of the market from the end of November onward. The facts of the situation are these: The Government never fixed the price for copper in the sense of establishing it. What it did by the pronunciamento of Sept. 21, 1917, was to fix a maximum price beyond which sellers might not go, and, sellers being unwilling to take any less, the price was substantially fixed, first at 23½c. and then at 26c., and those prices were unquestionably the market prices, all of the copper being sold at them. The price of 26c., first made on July 2, 1918, was to prevail to Aug. 15, being subsequently extended by agreement to Nov. 1, and then to Jan. 1. On Nov. 15, after the armistice, when it appeared that Government orders would soon terminate, the producers entered into a new agreement with the War Industries Board, whereby they promised to maintain production and wages until Jan. 1, and in return they received assurances respecting Governmental control of the market, which amounted to agreement that the Government would pay 26c. for any further copper it might order and would sanction the producers' asking that price from other buyers and acting unitedly. Since that time such copper as has been sold has been booked at 26c., but the quantity has been trifling (only a few thousand tons), and since the end of November there has been none sold, and there have been no buyers, and there has been no market. In the absence of either transactions or bids, we can do nothing but report "no market" and give no other representation of the situation than "26c. asked by all producers with Governmental sanction, and Governmental control against asking any more." We carry this revised representation back to Dec. 1 in accordance with the reservation that we published in our report of last week. This is still a tentative correction, for in the event that significant sales of copper should be made at 26c. (nothing higher is permissible while the control of the War Industries Board continues), after a period of reporting "no market" we should consider that for statistical purposes that figure should be recorded as the daily price in the interval. But if a market develops at a lower price, there will be a statistical gap, which cannot reasonably be filled in.

The *Ironmonger* says. "The general belief is that so far as this country [Great Britain] is concerned the full demand for copper is not likely to be felt for quite 12 months."

Copper Sheets—The base price of copper sheets is 35½@36c. per lb. Copper wire is quoted at 28½c. per lb. f.o.b. mill, carload lots.

Tin—There continues to be no market in tin. The War Industries Board has made a price of 72½c., New York, and the American Iron and Steel Institute is distributing tin at that figure to those who want it, but that is rather a distributing price than a market price. In the meanwhile, there are free transactions in lots of tin that are offered for resale and in tin that is produced by American smelters from Bolivian ore. During the last week business in electrolytic tin was done at 71½@72c., while there were transactions in tin of 99% grade at 70@71c. Such transactions reflect a market, although hardly a free and natural one, which there cannot be with the present elimination of importers and traders and merchants generally.

The tin production of American smelters is attaining considerable proportions, amounting to about 50 tons per day at present, with fair prospects of further increase by the end of the year. The conditions of purchasing Bolivian ore on the basis of London quotations, which are far below the level here, are now favorable to the American smelters.

Lead—The business in lead at the new prices was very small; if anything, it was smaller than in the previous week. It seems clear that consumers neither have to buy nor will buy at the present prices. In fact, some of the manufacturers have been surprised at the extent of the cancellation of orders, which has backed up pig lead on their hands. There is gossip about lead being offered for resale at prices under the Lead Committee's figure. We have heard 6.75c. mentioned. The Lead Committee will hold a meeting on Dec. 20, and it is not improbable that a free market in lead will be declared at that time.

Zinc—Prime Western spelter for December delivery has been rather scarce, and a premium has been asked for it and has been paid in some small business. For December delivery 8.15c. was bid today. This does not, however, reflect the real situation in the zinc market. The major market has now become for first-quarter deliveries, for which all producers are anxious to make sales. Some of them got 8c. in the early part of the week, and considered themselves lucky. Since Monday first-quarter deliveries have been unsalable at 8c. and, in fact, the metal has been offered at 7⅞ cents.

There was a cancellation of a Government order last week, which the seller was willing to accept on condition of reimbursement of loss. The Government official who made the cancellation claimed that the market was at a figure where there would be no loss, which the seller denied. In order to establish the difference between the Government and the seller, the contract was sold at public auction on the Metal Exchange Dec. 9 and realized 7.85c., St. Louis basis. This was for Grade C spelter. The contract provided for the delivery of 1000 tons previous to May 1, 1919, the metal to be delivered at the buyer's option, but not more than 250 tons per month. Under this contract, the buyer could call for 250 tons of December spelter. While there were special conditions connected with this contract, the transaction throws considerable light upon the real situation of the market. There was another large cancellation today.

High-grade spelter is offered freely both by producers and by consumers who desire to resell. If there has been any business it has been on secret terms. The War Industries Board has asked the producers to meet in Washington on Dec. 13 to consider the matter of refixing the maximum price on high-grade spelter. Why there should be any need to consider that question is beyond our comprehension.

The *Ironmonger* says that "the general expectation in Great Britain is for a recession in spelter prices as soon as the restrictions are removed, it being considered that there is over-production in this metal and that the industrial demand will not be sufficient to take care of the quantities that have been absorbed by war requirements."

The price schedule agreement for Joplin ore between miners and smelters has been abandoned. As we pointed out in the beginning, it was uneconomic and destined to failure. The primary cause of the discontinuance of the arrangement was the desire of some ore producers to sell when, how, and as they could.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—The market is dull and substantially unchanged. We quote spot at 8½@8⅝c. Out of such a price the producer gets very little, and it is therefore not surprising to receive the news that producers

in China are suspending operations. Nobody quotes figures.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.50@1.75 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—The market continued dull, but was a little weaker than last week. We quote $120. San Francisco telegraphs $115, weak.

Silver and Platinum

Silver—Market has no new features, price remains stabilized at $1.01¼ for 999 fine as the official price. Owing to the lack of steamer accommodations, no silver was shipped to London last week from New York. Trouble of the same kind exists at San Francisco. Shipping facilities for the time are limited.

Mexican dollars at New York: Dec. 5, 77½; Dec. 6, 77½; Dec. 7, 77½, Dec. 9, 77½; Dec. 10, 77½; Dec. 11, 77½.

Platinum—Strong at $105@106.

Palladium—Strong. No sales were reported to us, but it is certain that more than $135, the formerly fixed price, would have to be paid.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 7.—Blende, per ton, high, $75.30; basis 60% zinc, premium, $75; Class B, $60@50; Prime Western, $45@42.50; Calamine, basis 40% zinc, $40@35. Average selling prices: Blende, $44.32; calamine, $37.80, all zinc ores, $44.12.

Lead ore, high, $104.45; basis 80% lead, $100@80; average selling price, all grades of lead ore, $91 per ton.

Shipments the week: Blende, 7381; calamine, 237; lead, 1521 tons. Value, all ores the week, $474,520.

Not to exceed 300 tons of zinc blende was shipped this week, bought on the premium base, with prospects of less next week, with the arrangement for this basis schedule ending Dec. 21. The falling through of the schedule for Prime Western grades put 30,000 tons of ore on the open market. One smelting firm purchased upward of 8000 tons of this on a $45 basis, $1 off on each unit under 60% zinc to 58% and $1.50 per unit under 58% zinc. The bulk of this purchase was 57% and higher grades. Several other companies purchased heavily on $45 to $42.50 basis. The high lead settlement price was on ore purchased two weeks ago, this week's basis dropping to $80 per ton of 80% lead. A carload or two of lead-free calamine has held the market up to $40 basis, though the demand for other grades has fallen materially with the advent of the open market on blende, the quotable price being barely $35. Production is lessened by the heavy toll taken by the epidemic of influenza, in sickness and death. The lowered price of lead, it is predicted, will cause some Oklahoma mines to close, as the high level of lead gave them a small profit with the low zinc price, which will disappear now.

Platteville, Wis., Dec. 7—Blende, basis 60% zinc, highest settlement price reported, $76.45; base price for premium grade, $75; base price for high-lead blende, $47.50 per ton. Lead ore, basis 80% lead, $96 per ton.

Shipments reported for the week were 1703 tons blende, 120 tons galena, and 131 tons sulphur ore. For the year to date, the totals are 117,704 tons blende, 7647 tons galena, and 39,360 tons sulphur ore. During the week 2689 tons blende was shipped to separating plants.

Other Ores

In chrome, manganese, molybdenum and tungsten ores the situation remains just as we reported last week, and we cannot add any information of importance.

Other Minerals

Pyrites—Spanish pyrites is quoted, subject to the raising of the embargo, at 17c. on the basis of 10s. ocean freight, buyers to pay war risk and insurance. Restrictions still continue. It is predicted that they will be removed before the end of the year. Unchanged.

Ferroalloys

Ferroalloys—There is no regular market on ferromanganese or spiegeleisen. Furnaces quote ferromanganese nominally at the old price, $250, delivered, for 70%, and re-sale lots have been offered at $240 without finding takers. Furnaces have reduced their asking price on spiegeleisen from $75 to $70, furnace, for 16 per cent.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept.	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	101.125	32.361	44.324	49.500
Nov.	71.604	85.891	101.125	34.192	43.584	48.969
Dec.	75.765	85.960	.....	36.410	43.052	.....
Year	65.661	81.417	.....	31.315	40.851	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	26.000	110.000	122.000	125.000	137.000
Nov.	23.500	26.000	110.000	122.000	125.000	137.000
Dec.	23.500	.....	110.000	.....	125.000	.....
Year	27.180	.....	124.892	.....	138.401	.....

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542	(a)	244.038	343.905
October	61.851	(a)	247.467	335.543
November	74.740	(a)	274.943	323.550
December	87.120	.....	298.556	.....
Av. year	61.802	.....	237.563	.....

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	8.050	6.650	7.750	30.500	29.50
November	6.249	8.050	6.187	7.750	30.500	30.60
December	6.375	.....	6.312	.....	30.500	.....
Year	8.787	.....	8.721	.....	30.500	.....

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.473	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	8.801	7.813	8.451	54.000	54.000
November	7.847	8.491	7.672	8.141	54.000	54.100
December	7.685	.....	7.510	.....	54.000	.....
Year	8.901	.....	8.813	.....	52.413	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.58	34.40
October	37.25	36.60	33.95	34.40	33.95	35.40
November	37.25	36.60	33.95	34.40	33.95	35.40
December	37.25	.....	33.95	.....	33.95	.....
Year	$43.57	.....	$39.62	.....	$40.83	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.† Dec. 10	
Alaska Gold M.	4
Alaska Juneau	2
Am.Sm.&Ref.,com.	85¾
Am.Sm. & Ref., pf.	107½
Am.Sm.Sec., pf., A	93½
Am. Zinc	12½
Am. Zinc, pf.	45½
Anaconda	67¼
Batopilas Min.	1¼
Bethlehem Steel	68¼
Butte & Superior	21
Butte Cop. & Zinc	7½
Cerro de Pasco	34½
Chile Cop.	20
Chino	38½
Colo. Fuel & Iron	41
Crucible Steel	60½
Crucible Steel, pf.	89½
Dome Mines	12½
Federal M. & S.	12
Federal M. & S., pf.	40
Greater Nor., ore ctf	32½
Greene Cananea	48½
Gulf States Steel	68
Homestake	94
Inspiration Con.	48½
International Nickel	33½
Kennecott	36
Lackawanna Steel	72
Mexican Petrol.	161½
Miami Copper	25½
Nat'l Lead, com.	68
National Lead, pf.	104
Nev. Consol.	19¼
Ontario Min.	8½
Ray Con	22½
Republic I.&S.,com.	78
Republic I.&S., pf.	99½
Sloss-Sheffield	49
Tennessee C. & C.	15
U. S. Steel, com.	99½
U. S. Steel, pf.	113
Utah Copper	80½
Va. Iron C. & C.	58

BOSTON CURB* Dec. 10	
Alaska Mines Corp.	‡.12
Boston Ely	.90
Boston & Mont.	.54
Butte & Lon'n Dev.	.14
Calaveras	1¼
Chief Con.	3½
Contact	.05
Corbin	.25
Cortez	.17
Crown Reserve	.15
Crystal Cop.	.30
Eagle & Blue Bell	2½
First Nat. Cop.	2½
Houghton Copper	.40
Intermountain	‡.05
Iron Blossom	.47
Iron Cap	15½
Majestic	.25
Mexican Metals	.30
Mines of America	.70
Mojave Tungsten	.07
Nat. Zinc & Lead	.10
Nevada-Douglas	.38
New Baltic	1½
New Cornelia	16½
Oneco	.25
Pacific Mines	‡.35
Rex Cons.	.05
Yukon Gold	1

SAN FRAN.* Dec. 10	
Alta	.03
Andes	.04
Best & Belcher	.02
Caledonia	.01
Challenge Con.	.03
Confidence	.10
Con. Virginia	.09
Gould & Curry	.01
Hale & Norcross	.03
Jacket-Cr. Pt.	.05
Mexican	.04
Occidental	.40
Ophir	.03
Overman	.01
Savage	‡.02
Sierra Nevada	.08
Union Con.	.11
Utah Con.	.01
Belmont	2.85
Jim Butler	.37
MacNamara	.21
Midway	.19
Mont.-Tonopah	.12
North Star	.07
Rescue Eula	.09
West End Con.	1.25
Atlanta	.05
Booth	.12
Comb. Frac.	‡.02
Florence	.16
Jumbo Extension	.14
Kewanas	.06
Nevada Hills	.03
Nevada Packard	.29
Round Mountain	.20
Silver Pick	.05
White Caps	.13

COLO. SPRINGS* Dec. 10	
Cresson Con.	5.06½
Doctor Jack Pot	.04½
Elkton Con.	.06½
El Paso	.15
Gold Sovereign	‡.02
Golden Cycle	1.71
Granite	.18½
Isabella	.06½
Mary McKinney	.08½
Portland	1.08
United Gold M.	.15
Vindicator	.47½

BOSTON EXCH.† Dec. 10	
Adventure	‡.60
Ahmeek	75
Algomah	‡.30
Allouez	46
Ariz. Com.	13½
Arnold	‡.20
Bingham Mines	10
Bonanza	.07
Butte-Balaklava	.45
Calumet & Ariz.	68
Calumet & Hecla	445
Centennial	13½
Copper Range	46
Daly West	2½
Davis-Daly	5½
East Butte	9½
Franklin	4½
Granby	‡79
Hancock	‡7
Hedley	‡12
Helvetia	‡.20
Indiana	‡.60
Isle Royale	25
Keweenaw	‡1
Lake	5½
La Salle	‡3
Mason Valley	9¾
Mass	‡5
Mayflower	3½
Michigan	3½
Mohawk	55
New Arcadian	1½
New Idria	‡13
North Butte	13
North Lake	‡.40
Ojibway	1½
Old Dominion	38½
Osceola	53
Quincy	65
St. Mary's M. L.	45½
Santa Fe	.40
Seneca	15½
Shannon	3½
Shattuck-Ariz	‡16½
So. Lake	‡1½
So. Utah	‡.10
Superior	8
Superior & Bost.	3½
Trinity	3
Tuolumne	.80
U. S. Smelting	47½
U. S. Smelting, pf.	46½
Utah Apex	3½
Utah Con.	9½
Utah Metal	1½
Victoria	2½
Winona	.90
Wolverine	21
Wyandot	‡.50

N. Y. CURB† Dec. 10	
Big Ledge	1
Butte & N. Y.	.50
Butte Detroit	.02
Caledonia	.32
Calumet & Jerome	.50
Can. Cop. Corpn.	2½
Carlisle	‡2
Cashboy	.09
Con. Ariz. Sm.	1½
Con. Coppermines	6½
Goldfield Con.	.26
Goldfield Merger	‡.09½
Greenmonster	‡½
Hecla Min.	5½
Howe Sound	4½
Jerome Verde	‡.50
Louisiana	‡¾
Magma	29
Marsh	.04
McKinley-Dar-Sa.	.44
Milford	‡.75
Mother Lode	.35
Nixon Nevada	.35
Ohio Cop.	‡¼
Rawley	‡2½
Ray Hercules	3½
Richmond	‡.56
Rochester Mines	.31
St. Joseph Lead	14
Standard S. L.	‡
Stewart	.17
Success	.10
Tonopah	3½
Tonopah Ex.	1½
Tribullion	‡½
Troy Arizona	‡.10
United Eastern	4½
United Verde Ext.	‡35½
United Zinc	‡½
Utica Mines	‡.08

TORONTO* Dec. 10	
Adanac	.09
Bailey	.04
Beaver Con.	.35
Chambers Feriand	.10
Coniagas	2.00
Hargraves	.09
Kerr Lake	‡5.75
La Rose	.30
Lake Shore	.90
Min. Corp of Can.	‡2.50
Nipissing	8.50
Peterson Lake	.09
Temiskaming	.29
Wettlaufer-Lor.	.03
Davidson	‡.65
Dome Exten.	.25
Dome Lake	.15
Hollinger	6.12½
McIntyre	1.62½
Newray	.12½
Porcu. Crown	.22
Teck-Hughes	.25
Vipond	.20
West Dome	.10

* Bid prices. † Closing prices. ‡ Last quotations.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	—New York— Current	One Yr. Ago
No. 10	4.25	5.52	5.52	6.55	5.52	5.44½
No. 12	4.30	5.57	5.57	6.60	5.57	5.49½
No. 14	4.35	5.62	5.62	6.70	5.62	5.54½
Black						
Nos. 18 and 20	4.80	6.32	6.32	7.30	6.32	6.24½
Nos. 22 and 24	4.85	6.37	6.37	7.35	6.37	6.29½
No. 26	4.90	6.42	6.42	7.40	6.42	6.43½
No. 28	5.00	6.52	6.52	7.50	6.62	6.53½
Galvanized:						
No. 10	5.25	6.97	6.77	....	6.87	6.69½
No. 12	5.35	6.97	6.87	7.85	6.82	6.79½
No. 14	5.35	6.97	6.87	8.00	6.97	6.79½
Nos. 18 and 20	5.65	7.17	7.17	8.15	7.27	7.09½
Nos. 22 and 24	5.80	7.32	7.32	8.30	7.32	7.24½
No. 26	5.95	7.47	7.47	8.45	7.47	7.39½
No. 28	6.25	7.77	7.77	8.75	7.77	7.69½

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard bessemer rails	$55.00	$38.00	$65.00	$38.00
Standard openhearth rails	57.00	40.00	67.00	40.00
Light rails, 8 to 10 lb	3.13½*	83.00	3.13½*	68.00
Light rails, 12 to 14 lb	3.09*	82.00	3.09*	67.00
Light rails, 25 to 45 lb	3.00*	75.00	3.00*	65.00

* Government price per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅝-in. and larger	$3.90	$5.00	$4.50	$5,30	$6.70
Track bolts	4.90	6.25	5.50	Premium	8.00
Standard section angle bars	3.25	3.65	4.45	Premium	5.15

STRUCTURAL MATERIAL—The following are the base prices f. o. b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill, Pittsburgh	—New York— Current	1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in	$3.00	$4.27	$5.25	$4.27	$4.27	$5.25	$5.05
Channels, 3 to 15 in	3.00	4.27	5.25	4.27	4.27	5.25	5.05
Angles, 3 to 6 in. ¼ in. thick	3.00	4.27	5.25	4.27	4.27	5.25	5.05
Tees, 3 in. and larger	3.00	4.27	5.30	4.27	4.27	2.55	5.05
Plates	3.25	4.52	10.00	4.52	4.52	5.50	5.28

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4–5	$4–5	$4.50

RIVETS—The following quotations are per 100 lb.:

	STRUCTURAL Warehouse Mill Pittsburgh	—New York— Current	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
½-in. and larger	$4.65	$5.675	$7.00	$5.57	$5.55	$6.70	$7.00
CONE HEAD BOILER							
½ in. and larger	4.75	5.775	7.10	5.67	5.65	6.80	7.10
⅝ and ¾	4.90	5.925	7.25	5.82	5.80	6.95	7.25
¾ and ⅞	5.25	6.275	7.60	6.17	6.05	7.30	7.60

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+17½%
Galvanized cast steel rigging	2½%
Bright plow steel	30%
Bright cast steel	17½%
Bright iron and iron tiller	List

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$6.25	$7.25	$6.50	$6.25	$8.00	$7.25
Assorted	6.40	7.75	6.50	6.40	8.25	7.50

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh

Iron bars 3.5c. Steel bars 2.90c.

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
$0.12	$0.16½	$0.18	$0.19	$0.18½	0.16½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	16c.	14c.	15c.	16c.
Hollow	24c.	25c.	...	28c.

PIPE—The following discounts are for carload lots f. o. b. Pittsburgh, basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

Butt Weld

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
⅜, ½ and ¾	44%	17%	¼ to 1¼	33%	17%
½	48%	33⅓%			
¾ to 3	51%	37½%			

Lap Weld

2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

Butt Weld. Extra Strong Plain Ends

⅜, ½ and ¾	40%	22½%	¼ to 1¼	33%	18%
½	45%	32½%			
¾ to 1¼	49%	36½%			

Lap Weld. Extra Strong Plain Heads

2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Note—National Tube Co. quotes on basing card dated Apr. 1.

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Cleveland	Black Chicago
⅜ to 3 in. butt welded	40%	43%	41.1%
3½ to 6 in. lap welded	36%	39%	37.1%

	Galvanized New York	Galvanized Cleveland	Galvanized Chicago
⅜ to 3 in. butt welded	28%	28%	26.1%
3½ to 6 in. lap welded	25%	25%	23.1%

Malleable fittings, Class B and C, from New York stock sell at list plus 15%. Cast iron, standard sizes, 5%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	—New York— Current	One Year Ago	—Cleveland— Current	One Year Ago	—Chicago— Current	One Year Ago
Hot pressed square	$0.80	List	$1.25	$1.30	$0.98	$2.00
Hot pressed hexagon	.80	List	1.05	1.30	.78	2.00
Cold punched square	2.50*	List	.75	List	1.00	1.50
Cold punched hexagon	2.50*	List	.75	List	1.00	1.50

* List plus.

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50–10%	50%
Chicago	50%	45%
Cleveland	50–10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	40–10%	40–10%	37%
Larger and longer up to 1 in. by 30 in.	20–5%	20–5%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York $2.00 Cleveland List Chicago $2.50

For cast-iron washers the base price per 100 lb. is as follows:

New York $6.00 Cleveland $4.25 Chicago $4.50

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f. o. b. New York or Chicago.

	Carload	Lots	Less Than Carload	Lots
Tarfelt (14 lb. per square of 100 sq. ft.)	$64		$65	
Tar pitch (in 400-lb. bbl.)	21		22	
Asphalt pitch (in barrels)	40		45.50	
Asphalt felt	72.50		77.20	

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1.45	$1.70	$1.85	$2.10	$2.25	$2.50
No. 2 grade	1.30	1.55	1.65	1.90	2.00	2.25

Asbestos asphalt-saturated felt (14 lb. per square) costs $5.35 per 100 lb. Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.40 per roll in carload lots and $2.65 for smaller quantities.

Shingles, red and green slate finish, cost $5.75 per square in carloads, $6.00 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
St. Paul	$.056	$0.11	$0.162
Cincinnati	.086	.165	.218
Seattle	.09	.175	.30
Los Angeles	.0668	.12	.20
New Orleans	.14	.20	.29

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20 Ft. and Under				12 x 12-In. 20 Ft. and Under	
	Y. P.	Fir	Hemlock	Spruce	Y.P.	Fir
Cincinnati	$37.00	.....	$36.00	.....	$41.00	$40 00
Kansas City	38.00	40.50	$40.50	$38.50	43.00	42 50
Seattle	24.50	24.50	24.50	24.50	24.50	24 50
St. Paul	.....	52.00	48.00	48.00	.....	60 00
Denver	43.00	33.50	.....	.....	.....	39 00

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y.P.	Fir
Cincinnati	$43.00	.....	$39.00	$42.00	$38 00
Kansas City	45.50	$54.75	54.75	52.25	60 00
Seattle	24.50	24.50	24.50	24.50	24.50
St. Paul	62.50	45.00	43.00	.....	48 50
Denver	43.25	32.50	32.50	35.00	31 00

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$3.50	$4.37	$4.75	$4.32	$5 35
Cut	4.00	6.50	....	4.47	6.75

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Current	One Month Ago	One Year Ago
New York	$4.00	$4.00	$2.22
Jersey City	3.64	3.64	2.16
Boston	3.67	3.67	2.37
Chicago	3.05	2.45	2.21
Pittsburgh	3.15	2.55	2.31
Cleveland	3.32	2.72	2.44
Denver	3.67	3.67	3.20

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$17.50	$14.50	$2.90	$2.65
Kansas City	22.00	.....	2.35*	2.20*
Chicago	18.00	17.50	1.80*	1.10*
St. Louis	22.00	16.00	.....	1.75
Boston	22.20	18.20	3.65	3.35
Dallas	16.50	.....	.....	.....
San Francisco	20.00	.....	.....	2.15
St. Paul	25.00	19.00	1.97*	1.93*
New Orleans	19.74	16.45	19.47‡	.....
Cincinnati	14.20	.....	13.20‡	11.95‡
Denver	.....	.....	26.25‡	2.50*
Los Angeles	22.00	.....	18.00‡	14.50‡
Seattle	25.00	.....	.....	2.80†

* 200-lb. barrels. † Per 180-lb. barrel. ‡ Per ton.
Note—Refund of 10c. per cloth bag, amounting to $2 per ton.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel	$1.09	$1.25	$1.90	$1.25	$1.77	$1.22
5-gal. cans	1.84	1.35	2.00	1.40	1.97	1.32

WHITE AND RED LEADS in 500-lb. lots sell as follows in cents per pound:

	Red				White			
	Current		1 Year Ago		Current		1 Yr. Ago	
	Dry	In Oil	Dry	In Oil	Dry and In Oil		Dry and In Oil	
100-lb. keg	14.00	14.50	12.25	12.50	14.00		12.50	
25- and 50-lb. kegs	14.25	14.75	12.50	12.75	14.25		12.75	
12½-lb. keg	14.50	15.00	12.75	13.00	14.50		13.00	
5-lb. cans	.....	.....	14.25	14.00	16.00		14.50	
1-lb. cans	.....	.....	14.25	14.50	17.00		14.50	

MINING AND MILLING SUPPLIES

HOSE—

	Fire	
		50-Ft. Lengths
Underwriters' 2½-in.		85c. per ft.
Common, 2½-in.		40½ %

	Air		
	First Grade	Second Grade	Third Grade
¾-in. per ft	$0.60	$0.35	$0.30

Steam—Discounts from List

First grade..... 25% Second grade.....30% Third grade.....40%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	40+5%	35%
Chicago	45%	40+5%
Birmingham	35%	35%
Denver	40%	30%
Cincinnati	40—10%	40%

RAWHIDE LACING—40—5% off list.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ¾-in., 8 ft., ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200-ft. coils:

Boston	$0.34	Denver	$0.36
New York	.36	Kansas City	.34½
Cincinnati	.33½	San Francisco	.33
Chicago	.33	Seattle	.34
St. Paul	.34	St. Louis	.34½

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.99
Asbestos for high-pressure steam	1.76
Duck and rubber for piston packing	1.10
Flax, regular	.99
Flax, waterproofed	1.21
Compressed asbestos sheet	1.10
Wire insertion asbestos sheet	1.30
Rubber sheet	.66
Rubber sheet, wire insertion	.99
Rubber sheet, duck insertion	.55
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.21
Asbestos wick, ½- and 1-lb. balls	.75

REFRACTORIES—Following prices are f.o.b. works, Pittsburgh:

Chrome brick	net ton	$175.00
Chrome cement	net ton	75.00
Clay brick, 1st quality fireclay	per 1000	50.00—$55.00
Clay brick, 2nd quality	per 1000	35.00— 40.00
Magnesite, raw	ton	30.00— 35.00
Magnesite, calcined	ton	32.00— 35.00
Magnesite, dead burned	net ton	32.00— 35.00
Magnesite brick, 9 x 4½ x 2½ in	net ton	110.00—125.00
Silica brick	per 1000	50.00— 60.00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.
St. Louis—High grade, $55; St. Louis grade, $40.
Birmingham—Fire clay, $50; silica, $50; magnesite, $110; chrome, $165.
Chicago—Second quality, $25 per ton.
Denver—Silica, $35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	1.48	1.33
San Francisco	Douglas Fir—Green	1.35	.96
San Francisco	Douglas Fir—Creosoted	2.70	1.92

Prices per tie at Missour mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak, No. 4	.80	No. 5	.87

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago In Bbl.	Chicago In Car	Denver In Bbl. Lots	Denver In Carload Lots	
Pure steam-distilled pine oil, sp. gr. 0.925-0.94	$0.65–$0.67½	$0.70	$0.65	$0.76	$0 62	
Pure destructively distilled pine oil	.65– .67½	.60	.57	.55	.....	
Pine tar oil, sp. gr. 1.02 = 1.035	.38– .40	.40	.38	.65	.....	
Crude turpentine	.45– .47	.70	.65	.60	.....	
*Hardwood creosote, sp. gr. 0.96-0.99	.23	.40	.38	.42	.....	

* F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York			
	Current	One Year Ago	Cleveland	Chicago
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	$52.00	$58.00
Chicago	48.00	50.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder*
New York	.....	$0.31½	$0.38½	.....	$2 50
Boston	$0.25½	.28½	.35½	.42½	2.50
Cincinnati	.19½	.23½	.29½	.....	2.45
Kansas City	.21½	.27½	.34½	.44½	2.55
Seattle	.....	.25½	.32½	.....	.....
Chicago	.19½	.23½	.34	.44	2.45
St. Paul	.20	.27½	.34½	.....	2.55
St. Louis	.20	.24	.34½	.44½	2.15
Denver	.18½	.26	.33	.43	2.50
Dallas	.25	.33½	.40	.50	.....
Los Angeles	.22	.29	.37	....	3.05

CHEMICALS

SODIUM CYANIDE—New York price is 30c. per lb.; Denver, 44c.; Chicago, .31½c.; St. Louis, 35c.

SODIUM SULPHIDE—In New York the price per pound is 8½c. for concentrated, 4½c. for crystals. The St. Louis price is 9½c. for concentrated, 20c. for fused; the Chicago price is 7½c. for concentrated, 3½c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 16c. per lb.; Chicago, 16c.; Denver, 14c. f.o.b. Pueblo; St. Louis, 16c.

ALUMINUM DUST—Chicago price is $1.65 per lb.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points.

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union 25-Lb. Drums Per Drum
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52
Southeastern portion U. S. A.	115.50	110.50	1.63
Texas (except El Paso)	124.00	119.00	1.74
El Paso, Texas	126.00	121.00	1.77
Denver, Colo.	124.00	119.00	1.74
West Coast	129.00	124.00	1.81